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The Platoro District, Colorado

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SYNOPSIS—This district was discovered 40 years ago, when the oxidized ore was treated, but low-grade sulphides could not be profitably milled, so mining soon fell off until a year ago, when rich ore was again discovered, leading to renewal of activity. Gold and silver are found with copper in quartz veins in diorite and rhyolite; the district will become a producer of milling rather than of smelting ore. The several camps in the region are briefly described.

The discovery that led to the present excitement over the Platoro district was made by George Gilmore, in the autumn of 1912. He found some rich quartz on some old claims several miles west of Platoro, on the drainage of the Alamosa River. There were some patented claims near this place, and some old workings, but they were not extensive. The region is one of severe winters and excessive snowfall, so little prospecting could immediately be done. Long before all the snow was off in the spring, however, many people entered the region and, by July 1, the country had been prospected and many claims staked. This, in brief, is the history of the present excitement, but it is not the history of the district for that dates back many years ago.

The district is in the south-central part of the state, about 30 miles from the New Mexico line. The principal towns are Summitville, Jasper, Stunner, Gilmore and Platoro. All of these, except Gilmore, are old towns or camps which have been revived by the interest caused by the late discovery and can properly be included in the Platoro-Gilmore district.

The Miser Mine at Jasper

Lower and Upper Workings, Gilmore Mine

Placer Mining Begun in 1870

At Summitville, which is about 25 miles southwest of Del Norte, on the Denver & Rio Grande R.R., and reached by wagon road from that place, placering began in 1870, and Theodore Goupil is credited with having made about $20 per day for each man he employed in sluicing the gravels along the creek, now called Wightman's Fork. In 1871 or 1872, he located the first lode claim, now known as the Aztec. The Little Annie and other claims were the next locations, made by Peterson and Brandt, and the discovery of rich ore on the Annie claim brought a rush to the district when nearly all the present claims were located. The first mill was of five stamps, brought in in 1874 by Doc. Adams, who had purchased the Aztec claim. By 1882 four more mills had been built which, with the completion of the Iowa mill of 40 stamps that year, made a total of 105 stamps, all of which, however, were not working at the same time. Amalgamation with some concentration was the milling practice. The Little Annie 60-stamp mill was added in 1884 and, up to 1886, when the rich oxidized ores were

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worked out, the district was a heavy gold producer. The total production has been reported as high as $11,000,000. In 1882, Summitville had a population of 3000, 22 licensed saloons and three newspapers.

After the exhaustion of the free-milling gold ore, the mills could not successfully treat the low-grade sulphides and work was carried on only in a desultory manner. From 1897 to 1904, a deep crosscut tunnel, called the Golconda, was driven by A. E. Reynolds, of Denver, and his associates which, including the drifting along the vein, is 8000 ft. long. This tunnel, however, did not penetrate rich ore and, although many attempts have been made to treat the low-grade ore, the mine has either laid idle or been operated in a small way by lessees ever since.

Veins Not Well Defined

The ore occurs in a series of parallel veins in rhyolite. The veins are not well defined, but resemble shear or fault zones along which the solutions circulated and impregnated the rhyolite. In places the large phenocrysts of feldspar have been dissolved from the rhyolite and the mass of the rock has been silicified and mineralized, giving the appearance of honey-combed sugar quartz. Much of the rich free-gold ore was mined in opencuts on the surface, the veins in places being 30 to 40 ft. wide. Down a few hundred feet bornite, enargite, tetrahedrite and pyrite are found, sometimes filling the voids left by the dissolving out of the feldspar.

In 1900, Messrs. Ewing and Smith (Thesis No. 29, State School of Mines) made over 135 assays of ore from the Little Annie mine which, in gold, silver and copper ran from a few dollars to $160, few, however, being over $20. An average of 26 of their samples gave $8.88, of which over $4.50 was in copper, figuring copper at 16c. With this combination, it can readily be seen why the problem of treatment was not solved 15 years ago; with freight to Del Norte costing $8 to $12 and from Del Norte about $20 per ton; the transportation problem is a difficult one also. At present, Mr. Reynolds controls most of the claims and lessees are working about half a dozen men, searching mostly for rich, oxidized ore near the surface.

All the workings of the mines at Summitville are in the rhyolite. On the north and east this rhyolite is bounded by a fine-grained andesite. To the south runs a high ridge, which is composed of many varieties of rhyolite. The top of the ridge is capped by hard rhyolite sheets and underneath this capping is soft iron-stained rhyolite, which has eroded rapidly, leaving the high ridge with peaks of the harder capping, reaching to 12,500 ft. elevation. The south end is called Lookout, or Table Mountain, and, standing on it, one obtains a magnificent view of the continental divide to the west and down 2000 ft. into the valley of the Alamosa River, which flows south and east of the mountain. At the southern base of Lookout Mountain is the Pass-me-by mine, at which a small force of men is working, cleaning out a long adit previously driven and preparing to develop.

Passing eastward, down into the main gorge of the Alamosa River, the rhyolite disappears and all the rock is diorite, which extends over another ridge to the valley of the Conejos River and on past Platoro. This diorite is cut here and there by strong andesite dikes and south of Gilmore large bodies of andesite again appear.

The Gilmore mine is on the mountain above the new town of Gilmore, on the banks of the Alamosa. The workings are in quartz veins in the diorite. I also found patches of andesite near, which apparently were portions of a flow of andesite which has overlain the diorite before erosion took place. The quartz in the vein has been formed by the silicification of the diorite and the gradual change from unaltered diorite to pure quartz can be noted. The veins range up to several feet in width and disseminated through the quartz is fine pyrite, some gold telluride and free gold. On sinking on the vein the quartz flattened and pinched out. A crosscut tunnel, driven to intersect the vein at a lower level passed through a slide of large, loose boulders and then entered soft, decomposed diorite, which gave considerable water. No appreciable amount of quartz was found and Mr. Gilmore will do further development to ascertain whether the ore does not go down, or whether the vein has been broken by landslides. The boulders intersected in the lower tunnel and the topography of the hillside clearly indicate more than one slide or fault displacement. Near the Gilmore mine the "1876" claims, owned by A. C. Cole and associates, are being developed and other properties will be worked, if the results on these properties are satisfactory. Only a few men are at work on the hill at present.

In the bed of the Alamosa River, 1½ miles south of the town of Gilmore, what is known as the Lewis and Zangmeister claim is being developed. The vein is largely altered andesite along a contact between the andesite and rhyolite. A thin sheet of obsidian or volcanic glass also lies on the contact. An average sample of the ore gave $7 in gold and silver.

About two miles below the town of Gilmore is the Stunner camp and eight miles farther down the river is the camp of Jasper, at the north base of Cornwall Mountain. These camps were discovered in the rush to Summitville and Platoro, at which time the country was searched by prospectors as it has been searched again this last year. At Stunner several veins have been exploited, principal of which are the Eurydice and No. 10. The latter, from what indications are visible, is a quartz vein in the diorite, similar to the veins in the vicinity of Gilmore's mine.

Platoro the Center of the District

At Jasper, the Miser and Guadalupe are the principal mines. The former has been the scene of a rich ore strike within the last few months. High-grade ore is now being shipped to the smelters at Pueblo. Last, but by no means the least of the camps in the district, is Platoro, situated on the Conejos River, where its valley is about one mile wide, with the mountains rising on either side. It is reached by good roads from Monte Vista or Alamosa, Antonito or La Jara. Due to its lower elevation and more propitious site and ease of access, it has become a center for the rest of the district, except Summitville, and now has a population of several hundred people. The Valley Queen, Parole and Mammoth mines are southwest of town and all are on the same vein. The Forest King mine is on a parallel vein farther southwest, on the mountain. The mines were located in the early '80s, report by Alden C. Massey and Charles F. Fish, and were worked more or less continuously for years, producing upward of $400,000 in high-grade ore, but since 1893 little work has been done. The veins are of quartz and

in the principal mineral is pyrite finely disseminated through the quartz. The strike is northwest and, in places, the veins attain a width of 30 ft. The presence of casts of feldspar and hornblende lead me to infer that the veins are along the line of rhyolite dikes. The line of the dike was a plane for the circulation of the ascending solutions which silicified and mineralized the dikes and to some extent the walls. The Mammoth vein, at Platoro, according to the old books of the company, report cited, was shipping ore in 1890 in 10-ton lots, that assayed 250 to 400 oz. silver and 10 to 30 oz. gold. A large amount of development work was done, which opened up large tonnages of $7 to $10 ore, which have not yet been profitably treated.

In conclusion it might be said that when George Gilmore found the high-grade quartz, he caused the attention of mining men to be turned toward a district which has possibilities for new mines and has old camps with considerable tonnages of low-grade ore which could not be treated a few years ago, but in the light of present-day metallurgical developments, may be made to pay. The new strikes, while not warranting undue excitement, are worthy of development to determine their value and extent. The country is far from the railroad, rugged and the winters are severe, with heavy snowfall. The streams furnish abundant water for milling and, undoubtedly, if the district makes any production in the future, it will be more from milling than from smelting ores. Prof. H. B. Patton, with a party of seniors from the State School of Mines, has spent the summer studying the district for the state geological survey and a complete map and detailed geological report will be issued.

OPEN-FRONT MORTARS AT VAN RYN DEEP MILL

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North Carolina Mine Trespass Law

A new law enacted in North Carolina in March, 1913, provides for surveys of mines, and actions in cases of trespass. Section 1 provides that anyone whose mining property is being damaged can bring action to prevent the damage; when ore has been illegally extracted, double the gross value of the material as it lies in the ground is recoverable, together with awards for other damage; punitive damages are further allowed if the trespass is willful. Section 2 provides that anybody suspecting a trespass can obtain an order for survey from a competent court, provision being made for the entrance and protection of the surveyors appointed by the court in question. The costs for such an order and survey are to be borne by the person making the application, unless a case is made out against the other party and damages recovered, in which case the defendant will pay the cost of the survey.

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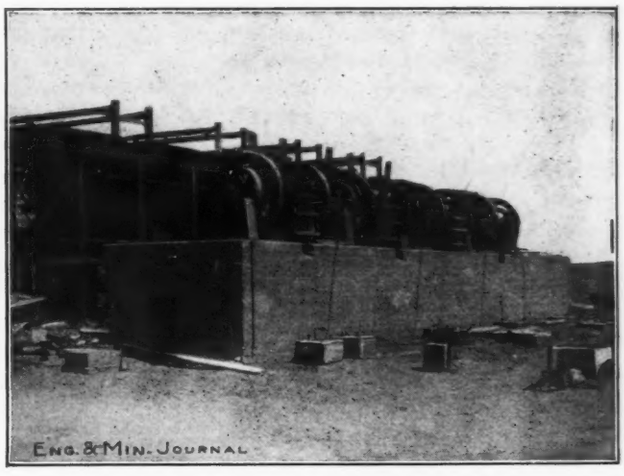
Johannesburg Notes

SPECIAL CORRESPONDENCE

The Van Ryn deep mine, which lies on the dip of the New Kleinfontein mine, has started crushing with its 80-head mill. This mine affords an example of the fact that mining, even on the Rand, may have surprises. When first opened, developments showed poor ore and much broken ground and the company had to be re-constructed. Recently rich ground was met with. In the last three months, 180,000 tons, valued at 11.3 dwt. over 48 in. were added to the reserve, which now amounts to 1,450,000 mill tons, valued at 9.4 dwt. It is estimated that about ten million payable tons will be contained in the mine.



ROCK BREAKERS AT VAN RYN DEEP MILL

The Springs Mines continue to show good results from development just started; 450 ft. sampled showed 10 dwt. over 36 inches. The position of the mines today is, generally speaking, good as regards development. The Cinderella Consolidated, which recently suspended milling to push developments, is driving east at the 4100-ft. level; at this depth 1875 ft. sampled show 8.7 dwt. over 54 in., the last 100 ft. of which show 15 dwt. over 23 in. This deep mine has produced about £1,200,000 worth of gold, but owing to the mistake of attempting to mill with only one 5-compartment shaft, costs were excessive, the managers were compelled to pick the eyes out of the mine, and little profit was made, though the mine was worked to a standstill. Ventilation and roof problems and the transport of the working force made it impossible to mine at such a depth with safety or profit.

Outline of Mesabi Topslicing Method

SYNOPSIS—Topslicing or caving is the one prevailing method of underground mining on the Mesabi at present. Shafts and main drifts placed where they best serve the orebody as outlined by drilling. Sublevels are developed from raises and caved in successive rooms from the boundary back. Drift-set, square-set and prop methods are in use under different conditions.

There is one prevailing method of underground mining in use on the Mesabi range at the present time, the topslicing or caving method. A top slice over the whole area of the orebody is removed, using timber to the full height of the ore. As fast as the various rooms of this top slice are worked out, the bottoms are covered with boards, and the timber is blasted down, allowing the overburden to cave and fill up solidly the space formerly occupied by the ore. When the top slice is out, another slice over the whole area is taken out just below it, also using timber the full height of the slice, up to the boards of the slice above. Rooms are blasted in as fast as they are mined out and the cave follows. Successive slices are taken in like manner to the bottom of the orebody. The use of timber to the full height of the ore in each slice, thus insuring a high percentage of extraction, is the most important feature of this method. The crosscuts to the various rooms are always in solid ground, providing a safe retreat for the miners. The general practice in opening up and mining an orebody to be worked on the system may now be briefly considered.

Location and Dimensions of Shafts and Main Drifts

For an orebody of considerable size, a shaft 8x20 ft. outside is generally used. There are two skip compartments, 5x6 ft., and one ladder-and-pipe compartment. 6x7 ft., with 6-in. dividers. The sets are of 12x12-in. timber. This shaft is located near the deepest part of the orebody, either in the ore itself or in the adjacent rock, so that the drainage of all the ore to be mined through the shaft may be taken care of.

Usually the sinking of a timber shaft, somewhere near the main shaft, is begun at the same time. From one to three additional shafts, depending on the size of the mine, are sunk at advantageous points. These may be 6 ft. square, or 6x9 feet.

A close study of the bottom contour map, as plotted from drilling records, is necessary to decide the location of the main drifts. Where the drilling has been sufficient, one or more troughs of deep ore will be found running through the orebody, generally from northwest to southeast, or from west to east, with the deepest part of the trough at the easterly end. It is in these troughs that the main drifts are located. The chief considerations are to have them near the bottom rock and still have them extend as near to the limits of the orebody as possible. The idea is to make the motor tramming long and the hand tramming short. When an orebody is 50 ft. thick or more, it is good practice to locate the main level high enough up in the orebody so that it will extend a considerable distance from the shaft, another main level being opened up nearer the bottom later. If the ore trough is wide enough, two parallel drifts, from 60 to 100 ft. apart, are driven, connected by a loop near the shaft. The advantage of two drifts lies in opening up the ground quicker for drainage; small connecting crossdrifts improve the ventilation; if one of the main drifts strikes rock unexpectedly, it can be discontinued temporarily, while the other continues, the rock encountered being explored therefrom. The main drifts are timbered with sets 5 ft. apart, using 8- or 9-ft. posts and 10- or 12-ft. caps, with lagging over the back. Vertical raises, 4 ft. square and without cribbing, are put up every 50 ft. along the main drifts and carried to the top of the ore.

Sublevels and Drift-Set Slicing

A top sublevel is located at such an elevation that the average height of the ore to be removed will be from 12 to 14 ft. capable of being taken out with drift-sets.

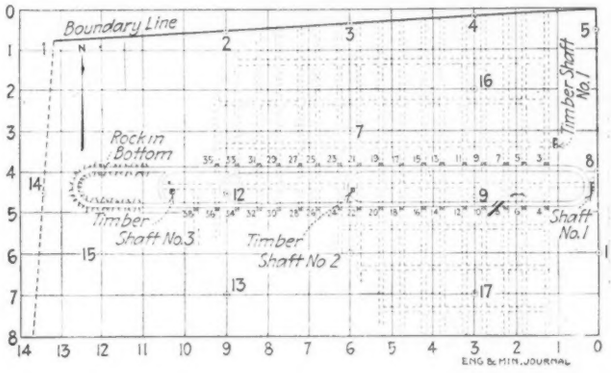


Fig. 1. Plan of General Underground Development

The sublevel is outlined with 5x6-ft. untimbered drifts run from each raise, parallel with each other and at right angles to the main drifts, until they reach the limit of the orebody or the boundary line of the property. At these outside limits the stoping or slicing of the ore begins. The general plan of development is exhibited in Fig. 1, an underground plan.

Fig. 2 shows a plan of two adjoining rooms, each 50 ft. long and 15 ft. wide, opened up at the boundary line and assumed to be against caved ground, together with a cross-section through one of them. When the boundary line was reached by crosscut No. 1, the first drift slice was started by blasting out all the ore at the set marked No. 1, and sets of timber with 12-ft. posts and 7-ft. caps, the caps being parallel with the crosscut, were put in place, using 6-ft. lagging overhead. Set No. 2, also in the crosscut, is the next to be taken and securely timbered and spragged, thus making the entrance secure. The four sets of timber at the entrance of the two slices of a room or stope are usually referred to as the "open sets." The first slice on the long side of the 50-ft. room is now completed by taking out sets 3 to 9. The track is continued from the crosscut into this slice as it advances. The next sets to be taken out depend upon whether the timber is taking much weight

Note—Excerpts from a paper entitled, "Mining Methods on the Mesabi Iron Range," prepared by a committee consisting of Willard Bayliss, E. D. McNeill and J. S. Lutes, for the Minnesota meeting of the Lake Superior Mining Institute.

or not. If it is not, sets 10 to 16 are consecutively mined out, completing the long side of the room. The short side of the room is now taken out in the order indicated: 17, 18, 19, 20. On the other hand, if the room is heavy and the timbers are taking considerable weight, the order of removing the sets must be changed. A safe exit for the miners has to be maintained and it would be inadvisable to weaken the entrance to the room by taking out set 10 at this time. The slice would be worked out from the far corner retreating toward the crosscut. Instead of taking set 16 first, however, the miners make their attack on set 15, because it would blast out a little easier and there would be more room for them to shovel into the tram car standing on the track in set 7 or 8. Therefore the sequence of sets taken out would be 15, 16, 14, 13, 12, 11. Set 10 is left standing to protect the entrance while the short side of the room is next mined out, and it is the last set to be taken. This order of working out a room is not invariable, many changes being made depending on conditions. Under a strong back, or with solid ore on both sides of a room, the ore

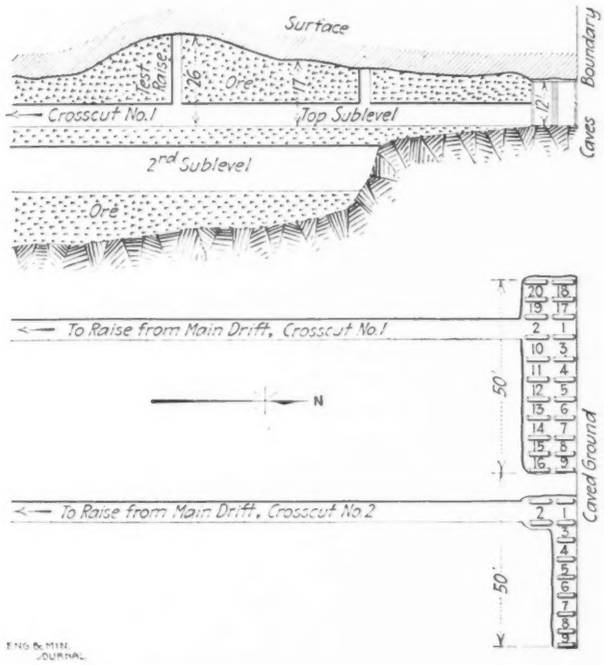


FIG. 2. SECTION AND PLAN OF CROSSCUTS AND ROOMS

would be taken out two sets wide from the crosscut back to the far end. Again, when the preceding room has not filled up solid with the cave, sets 10 to 16 would be taken first, leaving one set of solid ground against the unfilled cave, after which sets 9 back to 3 would be taken.

The reason for having a long side and a short side to a room is that thus only one set of curved rails need be laid to get the cars to convenient shoveling distance for all the sets. The track is laid in only one of the slices. The ore from the short side is shoveled into a car standing in the crosscut.

When a room is worked out, the side and ends next to the solid ore are boarded up with cull boards to prevent the sand coming in with the cave from mixing with the ore of the next room when it is mined. The bottom is also covered with boards if there is a slice to be taken out underneath. The double row of posts in the center, and those along the cave side, throughout the length of the room, are blasted out and the caved ground follows and fills the room. There is usually no difficulty in this operation; the room soon fills up solid against the boards so that another slice may be started alongside after a few hours.

The height of the ore on this top sublevel varies considerably on account of the rolling contact with the overburden. The length of posts used in the successive slices must be changed accordingly. The limit to successful slicing with drift-sets is reached when posts 16 ft. long are necessary. Rather than use such long posts to any considerable extent recourse is usually had to the square-set system, two sets high, which would take out the same height of ore.

SLICING WITH SQUARE SETS

In the cross-section, Fig. 2, a test raise is indicated which shows a roll in the back, making a maximum height of ore of 26 ft. above the top sublevel. Rather than open up a sublevel of limited area in the upper half of this roll, for the purpose of removing the ore with drift timber, it is the usual practice to mine it all out on square sets. The change from drift slicing to square-set slicing would begin where the height of ore shows 17 ft. The first square-set slice would be taken in the solid, that is, leaving one set of ore standing between it and the last drift slice. This is to insure getting the line on the square sets straight and at right angles to the crosscut. The two sets in height of this slice are both mined out and timbered as the slice advances. The pillar left standing next to the drift slice is then mined out and timbered, the order of removal of the sets depending on whether the ground is heavy or not. The long side and the short side of the room being mined out, the side and ends next to ore are boarded up in the same manner as a drift slice, except that lagging instead of boards is used on the bottom set. The lagging is stronger than boards and there is more pressure from the cave on account of the room being higher. The span between sets is also greater. The rooms are blasted in as soon as the timbers show that much weight is on them, which usually occurs when they are two sets wide. The blasting is done in such a manner as to leave undisturbed the timber which stands against the solid ore.

In the succeeding square-set rooms, the first slice is taken out along the cave, the caps connecting with the timber of the previous room. There are usually five sets on one side of the crosscut, and one set on the other, which, with the set occupying the crosscut itself, makes the total length of the seven-set room 51 ft. 8 in. A girt of odd length is used in connecting the timbering of end-joining rooms.

Bottom posts are 8 ft. over all, with a 4-in. tenon. Regular top posts are 8 ft., with two 4-in. tenons. Top posts of lengths varying from 4 to 12 ft. are used on the top set where the back is irregular. The regular cap is 8 ft. long.

There is very little square-set slicing exceeding four sets in height on the Mesabi range at the present time. With a greater height than this much trouble is experienced in keeping the rooms in shape, on account of the

pressure of the caved ground. Where the ore on the top sublevel is found to exceed the height of four sets, it is divided by opening up another small sublevel and is mined out with drift timber.

There are extensive stretches of ground in many of the mines where the ore is overlaid by firm taconite or slate. In such cases the top slice can be taken out with the use of props, spaced irregularly as required. The maximum height of the props used is 20 ft. Often the ore does not exceed this height and, consequently, can all be mined out in one slice. Where such conditions occur the cost of mining is considerably decreased.

Lower Sublevels

When the ore in any part of the top sublevel has been mined out back to a point 20 ft. from the raise from the main-level drift, a second sublevel is opened up by starting another crosscut from the raise, directly under the one above, and, of the same dimensions, 5 by 6 ft. Parallel crosscuts on the same level are driven from each raise as other places above are finished. The distance below the bottom of the top sublevel at which these crosscuts are started depends on the total thickness of the ore down to the main level, measured from bottom to bottom. This total height is divided so that the sublevels will be from 11 to 15 ft. high. Where as little as 11 ft. is selected, there remains 5 ft. of solid ground over the back of the second sublevel crosscut up to the boards of the top slice above. The ground is usually firm enough so that these crosscuts will stand without being timbered. They are driven to the boundary line or until they strike the bottom rock, when slicing begins and is carried on in the same manner as on the top slice. The rooms are timbered right up to the bottom boards of the slice above.

The topslicing method can be adapted to all conditions met with in underground mining on the Mesabi. It is favored alike by fee-owner and operator, for in these days of rapidly diminishing ore reserves, wasteful methods of mining are no longer tolerated. In any method of mining, the safety of the miner should be the first consideration; the conservation of the ore, the second. This system has both features to recommend it.

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Borax Production in the United States in 1912

In 1912 the production of borate ores in the United States was 42,315 short tons, as compared with 53,330 tons in 1911. The quantity stated is the crude ore, as mined for delivery at the mills or for shipment.

All of the borax in this country is now produced from ores derived from California; in fact, virtually the entire product is derived from four mines, one in Inyo County, one in Los Angeles and two in Ventura Counties. The property in Ventura County resumed production to a small extent in 1912, after having been closed since 1907, according to the U. S. Geological Survey. There are a large number of other large deposits of colemanite ore, similar to that now being mined; all of these, so far as now known, being situated in the State of California. Formerly borax was obtained from the so called marsh deposits, which were worked in Nevada, California and Oregon.

Finished Steel in Canada

The figures collected by the Statistical Bureau of the American Iron & Steel Association show that the total production of steel in Canada in 1912 was 853,031 long tons; 207,569 tons being bessemer, 645,062 openhearth and 400 tons special steel. The openhearth steel was all basic. The production included 4238 tons of direct castings from bessemer steel and 28,001 tons from openhearth steel. By provinces, Nova Scotia produced 416,313 tons and Ontario 417,634 tons, the remaining 19,084 tons being made in Quebec and British Columbia.

The production of steel ingots—including direct castings—in Canada has been as follows for nine years in long tons:

	Bessemer		Openhearth		Total
	Tons	Per Cent.	Tons	Per Cent.	Tons
1904	42,738	28.7	106,046	71.3	148,784
1905	164,488	40.8	238,681	59.2	403,449
1906	219,791	38.5	347,778	60.1	570,889
1907	202,268	31.3	440,936	68.2	646,754
1908	108,433	21.3	401,119	78.7	509,957
1909	182,304	27.0	496,142	73.0	678,751
1910	199,570	27.0	542,354	73.0	741,924
1911	189,797	24.0	601,074	76.0	790,871
1912	207,569	24.4	645,062	75 6	853,031

The small production of special steels is included in the totals. In most of the years given it was only a few hundred tons, except that in 1906 and 1907 it reached 3320 and 3550 tons, owing to the inclusion of some experimental work.

Finished Iron and Steel

The production of all kinds of finished rolled material in Canada in 1912 was 861,224 tons, 109,012 tons being iron and 752,212 tons steel. The total was greater than that for 1911 by 79,300 tons, or 10.1%. Of the total, rails were 423,885 tons; structural steel and wire rods, 64,082; plates, sheets, bars and other forms, 373,357 tons. Ontario produced 418,346 tons, Nova Scotia, 337,466; Quebec, 88,172, the remaining 17,240 tons being from New Brunswick, Alberta and Manitoba.

The production of rails and the total make of all kinds of finished iron and steel in Canada for 10 years has been:

	Rails	Total		Rails	Total
1903	1,243	129,516	1908	268,692	496,517
1904	36,216	180,038	1909	344,830	662,741
1905	178,885	385,826	1910	366,465	739,811
1906	312,887	571,742	1911	360,547	781,924
1907	311,461	600,179	1912	423,885	861,224

In 1912 there were 31 plants which made steel ingots or castings or rolled iron and steel into finished forms. Six of these were in Nova Scotia, eight in Quebec, 13 in Ontario, one each in New Brunswick, Manitoba, Alberta and British Columbia. Two new steel-casting plants were built during the year in Quebec and two in Ontario; at the close of the year a new merchant bar mill was under construction in Alberta.

Miscellaneous

Other production of finished material in Canada in 1912 was as follows, compared with the previous year:

	1911	1912	Changes
Forgings, tons	18,832	22,415	I. 3,583
Rail joints	.....	52,157	.....
Nails, kegs of 100 lb.	652,861	788,190	I. 135,329

The production of rail joints was not reported in 1911. Of the forgings made in 1912 there were 21,548 tons of steel and only 867 tons of iron. All the nails made were of steel.

Economical Fine Grinding in Pans

By M. G. F. Söhnlein*

SYNOPSIS—Experiments with a grinding pan for producing fine material for concentrating. It was necessary to devise a method of forcing the sand to pass between mullers and dies of the pan. Grinding efficiency is a function of the muller speed and speed of pulp passing under them. A critical speed of highest efficiency exists in each case.

Some time ago I carried out a series of experiments to determine whether fine grinding of sand for concentration could be economically done by a grinding pan. A 5-ft. Allis-Chalmers combination pan was used, driven by a 7½-hp., 550-volt, direct-current motor. The material to be ground was middling and tailing from Overstrom concentrators and those grains which, after one passage through the pan, have not been sufficiently comminuted were returned to the pan through a Dorr duplex classifier via the Overstrom tables, as shown in Fig. 1. The overflow of the Dorr classifier contains 22% of +200-mesh material, which consists of the lightest, and consequently the poorest, fine sand. The quantity of sand separated by the Dorr classifier is 38 tons per 24 hr., without considering the sand returned from the pan.

The object is to grind all the middling and as much of the tailing from the Overstrom tables as possible, because even the poorest sand tailing contains an appreciable amount of cassiterite. The maximum capacity of the pan had to be determined to find out if the installation of more pans would be required. If the capacity of the pan had not come up to expectations a tube mill would have been erected. But tube milling is an expensive operation where the price of a ton of flint pebbles is as much as $80, delivered at the mill.

Pulp Fed to Pan through Launder near Center

The pulp was dewatered to about 20% solids and introduced into the pan as close to the central column as possible. To obtain any grinding at all it was found necessary to reduce the speed of the muller from 60 to 32 r.p.m. If the speed was greater the sand, being fine, was whirled to the circumference of the pan without coming between shoes and dies. Although the pulp was returned to the center by the deflecting wings, the centrifugal force was too strong to allow the sand to settle, and the grains were discharged without being perceptibly ground. The capacity of the pan when running at 32 r.p.m. was not more than 2½ tons per 24 hr., so only the richest middlings from the tables could be ground. The accompanying screen-test table shows the grinding work done:

TABLE I. PAN GRINDING AT LOW SPEED

Classification	Feed pulp, per cent.	Discharge pulp, per cent
On 40-mesh	2.0	....
On 60-mesh	8.5	4.0
On 80-mesh	24.4	8.2
On 100-mesh	20.3	16.0
On 150-mesh	26.0	23.4
— 150-mesh	18.8	48.4
	100.0	100.0

Various heights of discharge were tried, but there was no important difference between a product discharged at 3 ft. and one discharged at 2 ft. above the shoes. The latter height was adopted, the pan requiring less power with a 2-ft. discharge. With a thicker pulp considerably more power was consumed, and the grinding improved only slightly.

Pulp Fed through Annular Feed Box and Pipes

To deliver the pulp as close to the shoes as possible and to prevent mixing the feed with material already ground, the pan was altered as shown in Fig. 2. A 2-in. wooden disk, made in halves, was clamped around the driver, and fitted with a sheet-iron rim. It served as a receiving box for the pulp, which thence was conveyed near the shoes through four 1½-in. pipes. These pipes were tightly fitted through holes in the disk, and clamped to the legs of the spider below. It should be said that the idea of this system of introducing the feed was from a pan

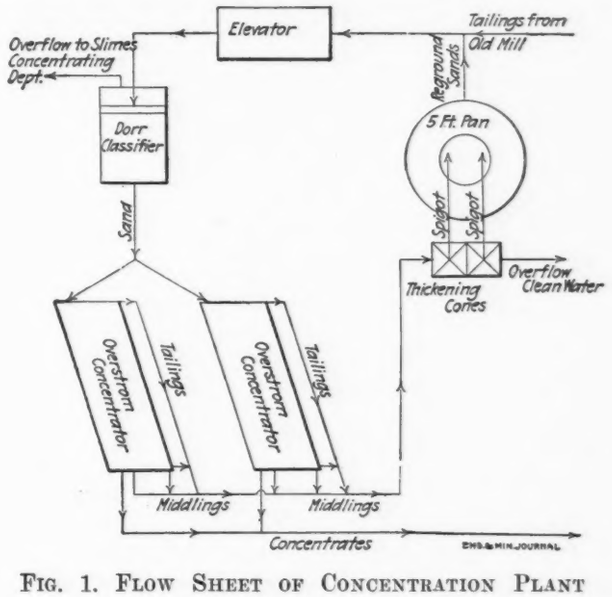

Fig. 1. Flow Sheet of Concentration Plant

manufactured by the Colorado Iron Works. By this modification the grinding was improved, so that the pan could handle 7 tons of sand per 24 hr. The speed of the muller could be increased to 40 r.p.m. With greater speeds the centrifugal force was so strong that most grains were drawn directly over the shoes to the circumference, and less grinding was done, as shown in the accompanying table:

TABLE II. PAN GRINDING AT MIDDLE SPEED

Classification	Feed pulp, per cent.	Discharge pulp, per cent 40 r.p.m.	Discharge pulp, per cent 50 r.p.m.
On 40-mesh	6.2	1.5	3.0
On 60-mesh	16.8	6.5	9.5
On 80-mesh	27.0	10.8	22.0
On 100-mesh	19.7	23.0	20.5
On 150-mesh	18.3	20.2	16.5
—150-mesh	12.0	38.0	28.5
	100.0	100.0	100.0

It will be noticed that the feed is coarser than in the first instance. This is because the sand was tailing from another concentrating mill and the coarsest grains were the poorest. Consequently at the discharge end of the Overstrom concentrators the grains gradually increase

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in size from head to tail, and if a larger quantity of middling is taken off the tables, it must necessarily be coarser.

Pulp Fed through Cylinder around Central Column

It is obvious that a more perfect grinding will be obtained if the grains are forced to pass from the center to the circumference between the shoes and dies. This has been accomplished by using annular wooden filling pieces fixed to the muller with setscrews so as to form a plain surface with the lower part of the legs of the spider, as show in Fig. 3. On top of the wood a ring of 1-in. angle iron is screwed, rubber packing being inserted between this ring and the plain surface referred to above. A ⅛-in. sheet-iron cylinder is bolted to the

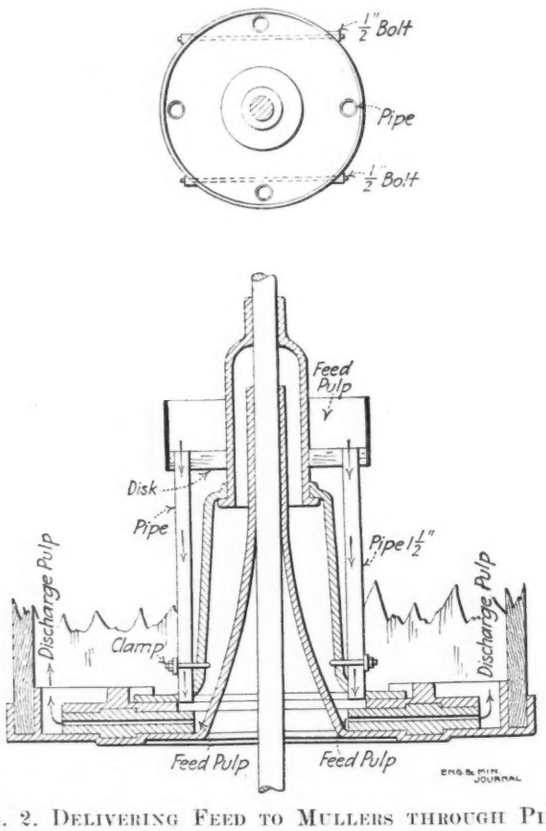

Fig. 2. Delivering Feed to Mullers through Pipes

angle iron. The space inside this cylinder communicates with the circumference of the pan only through the channels between the shoes, hence every grain entering this cylinder must pass underneath the shoes before being discharged, provided the muller revolves quickly enough to cause the grains to be caught by the shoes before they have again left the channels.

The communications between the shoe-channels and the dovetail sockets, which hold the shoes, in the muller, leave a passage for the grains to escape grinding. Therefore, these sockets have been completely covered by pieces of ⅛-in. plate, which are attached to the shoes by a setscrew. The returning of the pulp from the inner circumference to the center of the pan has been rendered impossible by the cylinder in the center, so the deflecting wings have been discarded. Grains, which have passed through the feed cylinder to the circumference can never return between shoes and dies, and should, therefore, be discharged at a small height above the muller. If the discharge is at a higher level, power is unnecessarily consumed in moving an unnecessarily large quantity of pulp. On account of lack of fall in the discharge launder I could not place the outlet of the pan lower than 20 in. above the shoes.

The speed of the muller was first increased to 52 r.p.m. The capacity of the pan had been so considerably improved, that all the middling and the greater part of the tailing from the Overstrom tables could be ground. The pan actually ground 23 tons of sand per 24 hr. to pass a minus 150-mesh screen. When a speed of 60 r.p.m. was given to the muller, the pan ground all the sand from the Overstrom tables (38 tons) to such fineness that they finally passed into the overflow of the Dorr classifier. The quantity of sand actually ground to minus 200-mesh is about 30 tons per 24 hr., which is classified as shown in Table 3.

TABLE III. GRADING OF GENERAL MILL SAND

Classification	Without regrinding in pan, per cent.	Reground by pan per cent.
On 40-mesh	20.0	....
On 60-mesh	20.5	....
On 80-mesh	16.5	1.2
On 100-mesh	10.5	5.6
On 150-mesh	8.5	4.5
On 200-mesh	5.5	10.5
— 200-mesh	18.5	78.2
	100.0	100.0

Quantity of tailing, 50 tons per 24 hr. Ground by pan to —200 mesh, (0.782 — 0.185) x 50 tons = 0.597 x 50 tons = 29.85 tons.

When grinding at this rate, sizing tests on feed and discharge are shown in Table 4. At one passage about 30% of the feed is sufficiently ground.

TABLE IV. CLASSIFICATION OF MILL FEED AND DISCHARGE

Screening	Feed pulp, per cent.	Discharge pulp, per cent.
On 40-mesh	20.0	1.0
On 60-mesh	21.5	12.5
On 80-mesh	24.0	22.5
On 100-mesh	9.5	9.5
On 150-mesh	13.0	11.0
On 200-mesh	7.5	11.5
— 200-mesh	4.5	32.0
	100.0	100.0

The grinding capacity is a function of the velocity of the pulp in the shoe channels, and the speed of the muller. The slower the pulp moves through the shoe channels, and the quicker the muller revolves the greater will be the chance of the grains being caught by the shoes. But the velocity of the pulp is determined by the centrifugal force which is proportional to the square of the number of revolutions of the muller. Therefore at a certain critical speed of the muller maximum grinding work is obtained. Any increase beyond this critical speed will result in giving the pulp such a velocity in the shoe channels, that the grains escape before they are ground.

The velocity in the shoe channels can be reduced by using a thick pulp, so that, to obtain a high critical speed, i.e., maximum grinding, the feed should contain a small amount of moisture. The critical speed further depends upon the size and specific gravity of the material ground.

I am now feeding a pulp containing 48% solids, which is the thickest that could be obtained by dewatering through spigots. A thicker feed was not tried, because the pan grinds all the required material now. For the same reason no attempt was made to determine the critical speed. From what has been set forth it is evident that the maximum sliming capacity of the pan on the same material must be more than 30 tons per 24 hr. It should be mentioned that the reground sand is not hard. About half of it is quartz, feldspar and slate in

equal proportions, and the remainder consists of iron oxides obtained by calcining the pyrite.

Consumption of Material and Power

Up to this time ordinary cast-iron shoes and dies, 1½ in. thick, have been used, and 0.67 lb. of iron is consumed for every ton of sand ground to minus 200-mesh. Local casting costs about $0.14 per lb., hence the expenditure per ton for wear of iron amounts to $0.094. In future shoes and dies will be made 3 in. thick, so as to diminish the amount of iron scrapped and to lose less time

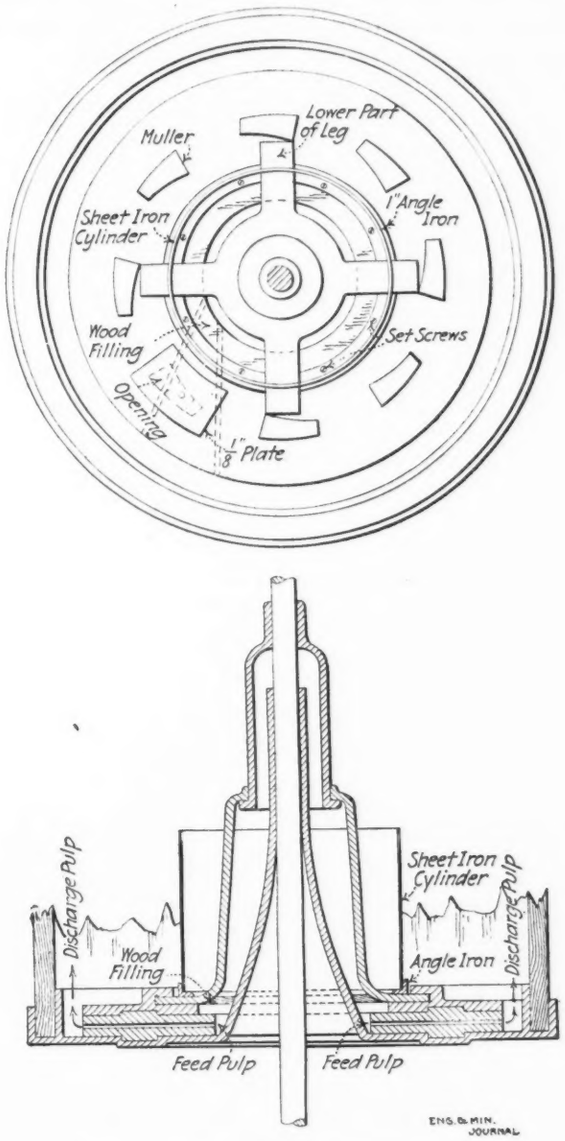

Fig. 3. Final Arrangement of Pan

in changing. It is planned to try hard iron and manganese steel, which it imported from Europe or the United States, costs less than the iron cast here. A set of shoes lasts only ⅓ as long as a set of dies of equal thickness.

When grinding 29.8 tons to minus 200-mesh, the pan requires 6.26 hp., or 4.76 tons are slimed per horsepower per 24 hr. The power expense for sliming one ton is $\frac{1}{4.76} \times 0.90 = \$0.189$. The cost of one electrical horsepower per 24 hr., generated by a producer-gas plant, is $0.90. The total cost, with labor and lubricating included, does not exceed $0.30 per ton. This might be considerably lower if the pan were run at its maximum capacity with a lower discharge level and with thicker shoes and dies of harder material.

I will not venture to say that sliming in the pan is cheaper than in a tube mill, because the work done by the latter machine on the same material has not been tried, but the failure of the pan to compete with the tube mill in so many other places may be ascribed to the fact that the ordinary amalgamating pan was used, without making the necessary changes in the construction. Of course, a machine designed more for amalgamating than for grinding cannot be efficient when only used for the latter work.

Small tube mills or Hardinge mills, used for sliming concentrate in cyanide plants, consume a great deal more power than a 5-ft. pan which will do the same work, if properly designed. This is especially important in places where the cost of power is high, as it is here. First cost and installation cost of tube mill are both considerably higher than with a pan.

I hope some one will continue these experiments with grinding pans in comparison with tube mills, to decide definitely which of the two is the most economical slimer for relatively small capacities.

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Flotation Processes at Broken Hill

Development of flotation processes continues at Broken Hill, N. S. W. A recent advance is said to be contained in a process developed by James Lyster, mill foreman for the Zinc Corporation. According to Mr. Loring, of Bewick Moreing & Co., as stated in the *Mining Journal*, July 19, 1913, this selective process for separating zinc and lead sulphides is important and is responsible for the high lead recovery being obtained at the South Blocks lead mine, of the Zinc Corporation. Since the introduction of the Lyster process for slime treatment, the recovery has risen to 87.6% of the lead in experimental runs, 85.3% being recovered in the primary treatment and an additional 2.3% from the zinc middling sent to the treatment department. Average recoveries in practice have been 84.2% lead and 70.7% silver. With lead at £15 per ton and a working cost of 5s. per ton under the Lyster process, the net profit per ton of slime is 16s. 10d.; with lead at £18 per ton the profit becomes 24s. per ton. Zinc can also be recovered by the Lyster process, but no attempt to accomplish this will be made until after the erection of a complete Lyster plant. This has just been commenced.

A working unit of the Horwood process is now in operation, treating high-grade mine-lead slime. Good metallurgical results are obtained but some mechanical difficulties will have to be overcome before it can be worked to full capacity.

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Steam for Cleaning Filter Cloths is an innovation introduced by F. C. Bowman, manager for the New Reliance Gold Mining Co., of South Dakota, according to "Metallurgical and Chemical Engineering," August, 1913. Steam under about 10-lb. pressure is used to disintegrate the limey incrustation on the canvas filter cloths from time to time and is introduced through the pipe ordinarily used for discharging the cake. That section of the filter through which the steam passes is slightly scrubbed with stiff brushes by which the scale is readily disintegrated and is thoroughly removed by a subsequent wash with hot water. Steam cleaning is practiced at intervals of about two weeks.

Canadian Iron in 1913

The American Iron & Steel Association reports that the production of pig iron in Canada in the first six months of 1913, including ferrosilicon and ferrophosphorus, amounted to 545,981 gross tons. The output in the whole of 1912 was 912,878 tons. The production of pig iron in the two halves of 1912 is not available. Of the total in the first six months, 532,431 tons were made with coke and 13,550 tons with charcoal, coke and electricity, etc. The production of basic pig iron in Canada in the first half of 1913 amounted to 292,625 tons, bessemer pig iron to 125,052 tons, and foundry pig iron, ferrosilicon, ferrophosphorus, etc., to 128,304 tons. Forge pig iron was not reported. Of the 545,981 tons of pig iron produced, 345,810 tons were delivered to mixers, open-hearth furnaces, etc., in a molten condition, 141,680 tons were sand cast and 58,491 tons were machine cast.

On June 30, 1913, Canada had 20 completed blast furnaces, of which 13 were in blast and seven were idle. Of the total 16 furnaces usually use coke for fuel and four use charcoal. In the first half of 1913 two plants made ferrosilicon and ferrophosphorus in electric furnaces. During the first six months of 1913 the number of furnaces actually in blast during a part or the whole of the period was 15, of which 14 used coke for fuel and one used charcoal. The average number of days the 15 furnaces ran was 167.6, which would give an average make per furnace day of 217 tons.

One entirely new furnace was completed in Canada during the first six months of 1913, No. 7 coke furnace of the Dominion Iron & Steel Co., at Sydney, Cape Breton, Nova Scotia, which was first blown in on May 22. It has an annual capacity of 91,250 tons of basic pig iron.

Two blast furnaces were being built in the Dominion on June 30. One of these furnaces will be operated by the Canadian Furnace Co., Ltd., at Port Colborne, Ont. When completed it will be 85x19½ ft. and will have an annual capacity of about 125,000 gross tons of bessemer, foundry and malleable pig iron. Lake Superior ore and Connellsville coke will be used. It is almost ready to blow in. The other furnace is being built at Parry Sound, Ont., by the Standard Iron Co., Ltd., of Montreal. When completed it will be 60x12 ft. and will have an annual capacity of about 36,000 gross tons. Charcoal will be used for fuel. Hematite and magnetite ores from Michigan and Ontario will be used. The Standard Iron Co. also operates a charcoal furnace at Deseronto, in Ontario. The annual capacity of the 20 completed blast furnaces on June 30, 1913, was 1,391,550 gross tons, and of the two building furnaces 161,000 tons, a total of 1,552,550 tons.

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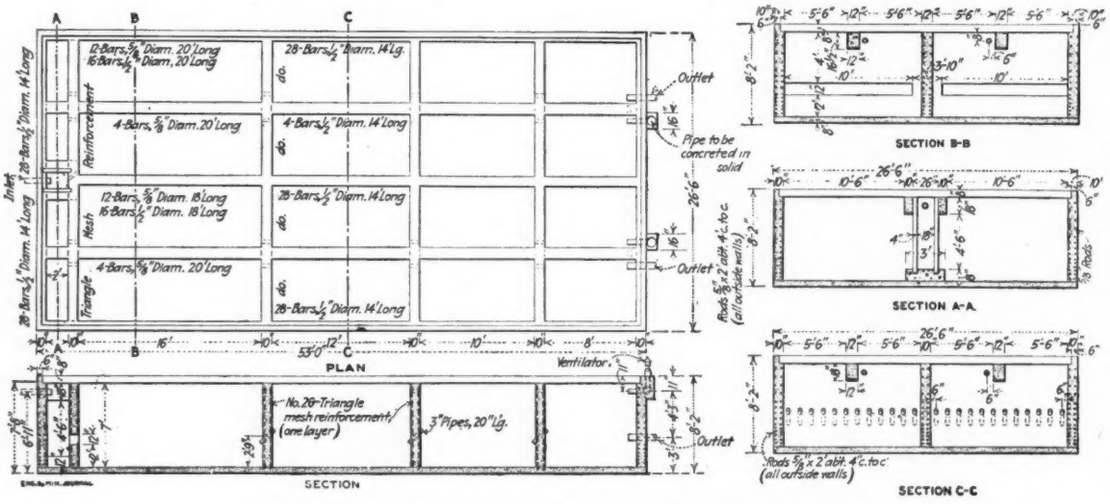
Septic Tanks at Clarkdale, Arizona

To avoid pollution of the Verde River, the United Verde Copper Co. is constructing a septic tank to take the sewage from the new smeltery and from the present "construction town" at Clarkdale. Another septic tank of similar size will be constructed for the main residence portion of Clarkdale, which will be built on the mesa a short distance from the present construction camp, the latter eventually becoming the "Mexican town."

The septic tanks will be 53 ft. long by 26 ft. 6 in. wide, and will be constructed of reinforced concrete. Each septic tank will require 450 cu.yd. of excavation and 115 cu.yd. of concrete, the mixture for the latter being 1:2½:5. The approximate cost of such a tank is from $1500 to $2000, depending upon the locality in which it is constructed.

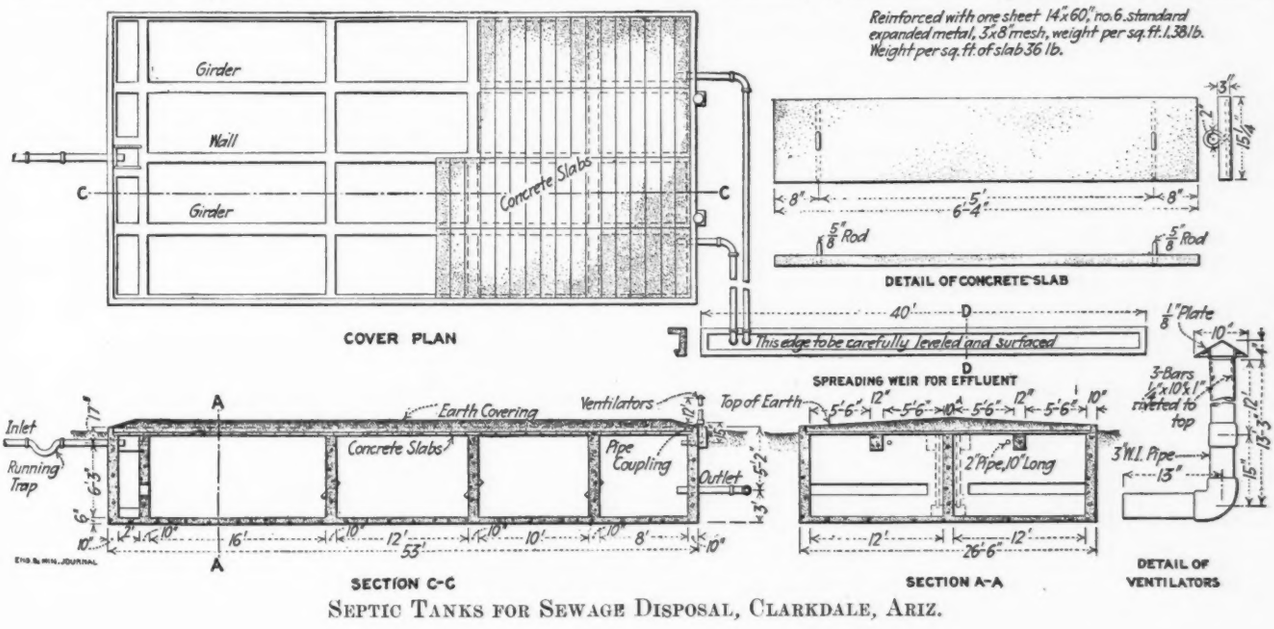


SEPTIC TANKS FOR SEWAGE DISPOSAL, CLARKDALE, ARIZ.

The septic tank, designed by Repath & McGregor for the Clarkdale works and construction town, is shown in the accompanying drawing. The tank is 7 ft. deep and is designed in two units so as to permit occasional inspection or cleaning. Following the receiving compartments, there are two series of four working compartments each. The first compartment is 16 ft. long, the second 12 ft., the third 10 ft., and the fourth 8 ft. The connection between the various working compartments is through twelve 3-in. pipes set in the partition walls about 3 ft. from the bottom of the tank and at an angle of 45° for the purpose of directing the flow to the top of the next compartment. The tank walls and partitions are 10 in. and the bottom 6 in. thick; the tank is covered with reinforced-concrete slabs, 6 ft. 4 in. long, 15¾ in. wide, and 3 in. thick. When for any purpose entrance to the tank is desired these concrete slabs may be removed, but during the normal operation the slabs are sealed by a cover-

ing of earth 12 in. thick at the center line of the tank and sloping to 8 in. at the sides. No air is permitted to enter the septic tank, but it is necessary to provide for the removal of gases formed within the tank, and this is accomplished by a 2-in. ventilating pipe in the partition walls of each compartment, the gases being removed through a 3-in. ventilator near the top of the last compartment.

The sewage enters the septic tank about 6 in. below the top through an 8-in. trapped iron pipe that delivers the material to a receiving box, a trough on each side connecting with receiving compartments, 2 ft. by 11 ft. 4 in. by 7 ft., from which the sewage passes through 12-in. slots about 2 ft. above the bottom to the two series of working compartments. The disintegration of the organic material in the septic tank is brought about by the anaërobic bacteria, i.e., those which live and act only in the absence of air. The material entering the tank separates into three portions: A solid portion which sinks to the bottom, a liquid layer in the center, and a portion



SEPTIC TANKS FOR SEWAGE DISPOSAL, CLARKDALE, ARIZ.

which floats at the top of the liquid. By the action of the anaërobic bacteria the solid floating and settled portions are gradually converted into liquid and pass through the pipe connections in the partition walls to the succeeding compartments and out through a 4-in. pipe about 2½ ft. above the bottom of the last compartment. Most of the work is accomplished in the first compartment and the succeeding compartments are gradually reduced in length. The outlet pipe from each series of compartments leads to a spreading weir, 40 ft. long by about 2 ft. wide, over which the effluent passes in a thin layer to a gravel bed about 40 ft. square where purification is finally accomplished by aërobic bacteria and sun light. While the organic material in the sewage is rendered innocuous by this treatment, no attempt is made to deodorize the released gases. The septic tank should consequently be built at some distance from any residences or other inhabited buildings. There are many mining communities where sanitary conditions could be vastly improved at comparatively small expense by the installation of a system of this sort.

Mining in Siskiyou County, Calif.

SPECIAL CORRESPONDENCE

Siskiyou County mining has been especially active in the present season, both in production and development. The activity is particularly noticeable in the Salmon River quartz-mining region and in the placers of the Scott River region. The Salmon River region extends from Forks of Salmon east to Snowden and south to Black Bear, including the Russian Creek mines and the prospects around Tanner's Peak. The recent showings made by the Homestake mine, near Snowden, owned by R. S. Taylor, of Yreka, have attracted a great deal of attention to the Liberty (or Snowden) district. Some very rich rock has been taken out, and Mr. Taylor has sold $7000 worth of specimens and hand-mortared gold in the past year. The ore occurs in slate, the veins and pockets varying from 3 in. to 3 ft. wide. Development is in progress to determine the extent of the pay ore before deciding upon reduction equipment. Five hundred tons of ore are ready for treatment. Three tunnels have been driven and present work is chiefly confined to advancing one of the tunnels through the ridge to a point where water can be obtained from a ditch with a capacity of 150 in., which was completed last year. The Highland mine is employing 25 men in mine and mill and is operating steadily. It is owned by the Highland Mining Co., composed of Holland men, who are reported to have paid a large price for the property.

The Cub Bear, owned by the Siskiyou Syndicate, of which I. J. Luce, of Etna, is president and manager, is situated between the Homestake and the Highland. This mine is producing some high-grade ore, and recently sent a 10-ton lot to the Advance mill. This is exclusive of the ores sacked for shipping. The recent strike which disclosed a 14-in. vein has been expected, as the development has progressed steadily toward this point indicated by the cropping. The company expects to extract 1000 tons of ore before installing a mill, and proceed with the development of the orebodies. One hundred tons are now on the dump, said to average $25 per ton. The

present work is driving into the hill that rises 1000 ft. above the tunnel level. There are three tunnels, all of which have shown good development. Charles J. Ritz is superintendent.

The Advance mine and mill, owned by J. Wood, of Denver, are operating. The Cliff mine, owned by H. B. Wintering, is one of the large mines of the district; and the Overton is another promising mine. The Hickey mine in White Gulch has been leased to J. V. Kappler, R. L. Younger and F. P. Dowling. The 5-stamp mill was put in commission July 14. There are 300 tons of ore ready for milling. The ore comes from a 9-ft. ledge.

Over the ridge on the east fork side in Sawyers Bar district, are a number of good properties: The Foster mine on Trail Creek, owned by Foster Bros.; the Uncle Sam, owned by J. Sheffield; the Excelsior, owned by Townes & Tebbe; the Kleaver, owned by I. Kleaver; the King Solomon, said to be owned by the Curtis Publishing Co. The old mines in this section that have records of production are: Dannenbrink, owned by G. A. Dannenbrink, which has produced about $1,000,000; Ball mine, owned by the California Consolidated Mining Co., W. H. Young, manager, with a record of $2,000,000; Black Bear, owned and formerly operated by John Daggett, which produced $3,000,000. This mine is being reopened by Farish Bros., who are unwatering it and will equip the mill with electric power. The properties in Tanner's Peak district are all in the prospective stage, and the results of prospecting and development are reported good for the amount of work done, which consists chiefly of tunnels of 200 ft. or less. These mines and owners are: Malloy, owned by Dan Malloy; Enterprise, by George E. Townes; Hennings, by J. Hennings; Kismet, by Kismet Mining Co.; Two Step, by Milton Dunphy. The postoffice of these mines is Sawyers Bar. In this district, and between the claims mentioned there is a large undeveloped territory, with abundant timber and water, that is reported on good authority to be well worth the attention of prospectors. The formation on the south side of Salmon River is slate; the formation of the Tanner's Peak district in diorite.

The Scott Bar hydraulic miners are interested in the enlargement of the San José ditch, which at the present time heads in Tompkins Creek. The extension will secure a flow from Kelsey and Canon Creeks. When completed this ditch will make possible longer seasons of operation in hydraulic mines, which at present is equal to about seven months in the year. The ditch will bring 3000 in. more water, which it is believed will extend the season to nine or 10 months. The Quartz Hill hydraulic mine at Scott Bar, and the Milne, situated about three miles below, have closed successful seasons. D. McCarthy uncovered a rich pocket on his property near Quartz Hill. The Shorb Bros. have taken out a large quantity of gold, amongst which were some exceptionally large nuggets. The Siskiyou Mines Co., at Morgan's Point, taking advantage of recent heavy rains, will extend its season. The mine is running to full capacity, with a good head of water. Reeves Davis, of Fort Jones, is also operating with a full head of water, expecting to continue till late in August. He is installing an undercurrent sluice for saving the black sand. The saving of black sand has not been common practice, but it is a growing one.

Tin in Nova Scotia

It is reported that a new tin discovery has been made in Nova Scotia. We are informed that a tract of nearly 4000 acres has been taken up by prospectors in Lunenburg County, near Lake Harris, which is about 20 miles from Chester Basin, the nearest railway station, 40 miles southwest from Halifax. Such reports as have been received indicate that a series of narrow veins cross the entire property, the largest being probably about 4 ft. in diameter, the country rock being granite and slates.

In this vicinity there are one or more eruptive porphyry dikes, and the quartz veins follow fissures due to the intrusion of the porphyry, wolframite being found principally in the quartz, and the tin in altered, very feldspathic granite.

The tin, while largely cassiterite, is at least to some extent in the form of stannite, the latter being associated with some copper and iron pyrites. The tungsten occurs as wolframite. Scheelite has been before found and mined in Halifax County, but no wolframite, if we are correctly informed.

The property has just begun to be prospected by trenching through the heavy, overlying vegetable growth, and by two shafts which have reached a depth of something under 30 ft. It is said that the mineralization of these narrow veins is quite uniform; a large number of samples taken from widely separated points running from about 2% of metallic tin, as a minimum, to about 2.75% as a maximum. The average of tungsten has not been determined. Judging from specimens which we have seen, the coarse mica which usually characterizes the tin occurrence in the so called greisen or pegmatite veins is absent, and this would be an advantage in concentration, as it has been found in practice that in spite of the great difference in specific gravity, mica carries off mechanically a considerable portion of fine cassiterite.

It is stated that the property is largely controlled by wealthy lumbermen, who have abundant means to develop the property and determine whether or not the grade and extent of the ore justifies expenditure for the erection of a mill and power plant. Water power is available in the vicinity. The presence of tungsten and copper complicates the metallurgy for tin and *vice versa*, if tungsten should prove the more valuable constituent.

Ontario Mineral Production in 1913

The mineral production of Ontario for the first six months of 1913, according to the Bureau of Mines, amounted to about $18,600,000. This includes gold, silver, copper, nickel, iron ore, pig iron, cobalt, cobalt oxide and nickel oxide. Increases in every metal are noted except in silver and in cobalt and nickel oxides, which show slight decreases. The total net increase in value over the corresponding period of 1912 was about $3,350,000. The gold production for the period in question was $2,171,147; that of silver, 13,890,692 oz.; that of copper, 5873 tons; that of nickel, 12,104 tons; that of pig iron, 369,450 tons. The bulk of the gold, of course, came from Porcupine. The most substantial increases were those of gold, nickel and pig iron.

Genesis of the Butte Ores

SYNOPSIS—Butte ores derived from parent granite magma, along with quartz-porphyry dikes. A zonal arrangement of deposits. Factors governing distribution of ores. Alkali sulphides formed in rising solutions. Distribution of typical minerals. Order of formation of minerals. Only one period of deposition, not capable of division into epochs.

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All geologic evidence in the Butte district points to the conclusion that the ores there were derived primarily from igneous rock. While sedimentaries may have overlain the granites of the district, there is no evidence that they played any part whatever in the formation of the ores, and at present no sedimentaries exist within a distance of 15 miles. Since the deposits are concentrated within a relatively small area, the source of their formation must be sought in close proximity thereto.

Ore Solutions and Quartz-Porphyry Dikes from the Granite Magma

Distinctive of the Butte area as against other mining districts in the great Boulder granite batholith, are the quartz-porphyry dikes. Rhyolites, on the contrary, are found in other neighboring districts as well where practically no copper exists, and since at Butte they are later than the earlier vein systems and since the veins tend to become poorer near the rhyolite, it follows that the rhyolite played an unimportant role in the deposition of the Butte copper.

There are three or four well defined quartz-porphyry dikes in close association with the copper ores of the main central zone. These dikes extend in the easterly and westerly direction and coincide in a significant manner with the dips and strikes of the veins of the Anaconda, the oldest vein system. Their areal extent seems to be increasing in depth, their thickness becoming greater, their extent along the strike larger and new dikes unsuspected at the surface appearing.

Zonal Arrangement of Deposits

The ore deposits show a zonal distribution. The main or central copper zone occupies a large area of altered granite in the vicinity of the Mountain View mine, and in this zone sphalerite and manganese minerals are absent. An indeterminate zone surrounds this central zone in which the ores are predominately copper, but in which some sphalerite is found, together with manganese minerals near the boundary. Finally an outer or peripheral zone of undetermined width surrounds the intermediate zone and shows characteristic vein fillings of quartz, rhodonite, sphalerite, pyrite and rhodochrosite. In this zone are the manganese-silver veins. It is noteworthy that the quartz-porphyry dikes occur in the central copper zone. It is not to be supposed that the quartz-porphyry magma was the immediate and direct source of the ore minerals of the vein, but rather that the quartz porphyry as well as the ore solution had an original common source in the granite magma, and the principal part played by the quartz-porphyry was to open a way for the ore-forming solutions of deep-seated origin to reach the higher regions in which they now are found.

Most of the Solution Elements Were Original

There is little doubt but that deep-seated, hot, aqueous solutions were the source of the ores, and judging by the minerals deposited from these solutions it would seem that the important constituents were original with the source of the solution and were not derived from the granite which the solutions traversed. Thus copper, sulphur, arsenic, zinc, manganese, lead, antimony, silver, tungsten, barium, fluorine, etc., which must have been in the uprising solution have been detected only in unimportant quantities in the normal granite rock. Since iron and silica are present in the original granite, it is unnecessary to assume that they were contained in the original solution, although they may so have been. The high temperature and vigorous chemical activity of the solution are evidenced by the strong alteration of the wall rock to which they had access.

Deposition Influenced by Temperature, Pressure and Solfataric Action

It is probable that the constituents of the ore-forming solutions were deposited largely through metasomatic replacements of the country rocks along fissures. The factors which influenced deposition at different horizons and the distribution of the ores, are believed to be chiefly those of temperature and pressure. Added to this is a certain solfataric action. Thus it is probable that at great depth hydrogen sulphide was a constituent of the solution. One phenomenon of alteration is the abstraction of sodium and calcium from the granite and the formation of pyrite. This would seem to be the result of the reaction of water, bearing hydrogen sulphide, with the iron, soda and potash minerals in the granite. It would seem thus that the pyrite and, by a similar line of reasoning, the quartz, present in the Butte veins were not primary constituents, but were abstracted from the granite by the solutions in their course of travel. Some of the iron taken from the granite was deposited within relatively short distances as pyrite and some was probably carried in solutions uncombined with sulphur until more favorable conditions for deposition were encountered. The sodium and calcium taken from the granite were not again deposited but had outlet on the surface in the form of mineral springs. As a result the solutions became increasingly alkaline toward the surface up to a certain point. This change in alkalinity bears a relation to the zonal arrangement of the ores. Chemical activity during the early stages was more intense, since the solutions were hotter than at later periods and had direct access to unaltered granite.

A Decrease in Alkalinity Followed an Increase

From the state of maximum alkalinity, reached by the early high-temperature waters working on unaltered granite, there was probably a gradual return to a condition in which hydrogen sulphide was present in a greater ratio. Thus, after a certain length of time the solutions no longer reacted chemically with the granite, since this was already altered; in other words, a partial chemical

Note—Excerpt from a paper by Reno H. Sales, entitled "Ore Deposits at Butte, Mont." "Bull." A. I. M. E., August, 1913.

equilibrium was established between the solutions and the contiguous layer of altered granite, which would prevent the further extraction of sodium, calcium and iron. Assuming then a fairly uniform hydrogen-sulphide content in the original deep-seated solution, that portion of the solution which was latest to leave its source, would find less opportunity to extract the alkalies and iron. The formation of solid vein fillings would have a similar effect in preventing contact between the vein-forming waters and the minerals. By this process of reasoning, if the vein pyrite, as supposed, was largely derived from the granite, in the later solution it would be less prominent and should be found in less quantity in the later vein filling.

Occurrence of Chalcocite and Enargite

This series of chemical reactions between the uprising solutions and the granite are not to be assumed the only factors influencing the distribution of the ores in the districts, but to them must be added variations in temperature and pressure, changes in the original solution from time to time, and the mingling of unlike solutions. Concerning the possible influence of these various factors as affecting the distribution of ore types, many facts have been observed that are of particular interest. For example, primary chalcocite and enargite occur only in association with the intensely altered granite of the district. In the central copper zone or in veins where alteration has reached an advanced stage, these two minerals are commonly found in intimate association with other vein minerals formerly ores, and in addition small veins or stringers, largely chalcocite and enargite, can be found extending outward and replacing the wall rock, the granite being in actual contact with the copper minerals. In areas of unaltered granite the two minerals are confined to highly altered zones associated with the veins, and never extend into the unaltered granite itself. The solutions themselves did extend into the granite as is evidenced by stringers of other minerals therein, but the enargite and chalcocite are always associated with altered vein material.

Distribution of Quartz, Pyrite, Sphalerite, Etc.

Quartz and pyrite are found abundantly in association with all stages of rock alteration and with all periods of primary ore deposition, although pyrite is more common in the central zone. It is less prominent in the Blue veins than in the Anaconda veins, and still less important in the Steward oreshoot, indicating that the later vein-forming waters either contained less pyrite or the conditions were less favorable for deposition, inasmuch as the Blue veins are later than the Anaconda and the Steward later than either.

Sphalerite is rarely found where alteration is intense. It is believed to have been deposited under conditions of alkalinity, similar to those under which enargite was formed, but at lower temperatures. Being more soluble it would more readily migrate than would enargite. Galena is a relatively uncommon mineral, associated usually with sphalerite and is not found in the central copper zone. Rhodochrosite is abundant in the veins of the peripheral zone but never occurs in the central zone. Chalcopyrite is not an uncommon mineral associated with sphalerite, quartz and galena in the manganese-silver veins.

No Distinct Periods of Deposition

The evidence points to the fact that the ores of Butte were derived from one general centralized source and, speaking broadly, at one time. The hypothesis that the manganese-silver and zinc veins belong to an epoch separate from that of the copper veins will not hold good. Thus going outward from the central zone, there is no instance where an early copper vein is cut by later veins of different mineralogical character, as should be the case, if, for example, the Blue fissures were of a definitely later period than the east-west copper veins of the Anaconda system.

The suggestion also is untenable that the manganese-silver ores represent an invasion of an older copper area, or *vice versa,* for the reason that a later mineralization period could hardly thus completely surround a central core without showing its typical ores within the central core itself. Structural relations indicate that the east-west fractures of the manganese-silver area are of the same age as the Anaconda east-west fractures of the copper area. The Blue veins cut both sets of fractures and contain mineral typical of the zone through which they are passing.

Structural relations point strongly to the conclusion that the primary ores of the whole district are products of one great vein-forming period beginning immediately after the appearance of the Anaconda fractures, and ending with the completion of deposition in the Steward veins. While activity in vein formation unquestionably varied greatly at different times during this period, there can be no definite division into epochs. The fracturing of early-formed ore with subsequent filling of the fractures by new minerals did not mark distinct periods of action, but rather faulting movements during the deposition process itself.

Sequence of Deposition of Noncupriferous Minerals

It is believed that the minerals in the veins were more soluble in strongly alkaline sulphide solutions than in hydrogen sulphide solutions under conditions of constant temperature and pressure, and also were more soluble in hot water than in cold. The areal distribution of the mineral types in the Anaconda system, which is the oldest, is believed to be largely due to the relative solubility of these various minerals in the original waters from which they were deposited. When the degree of high alkalinity was attained, following the extraction of soda and lime from the granite, quartz and pyrite were deposited in abundance, while the temperature was high, thus forming the massive so called quartz-pyrite veins of the central and intermediate zones. Under high temperature conditions, sphalerite, rhodochrosite, galena and chalcopyrite, were more readily soluble and migrated outward to the intermediate and peripheral zones, where with quartz and pyrite they formed the manganese-silver veins. During this period of migration the solutions became cooler but lost none of their alkalinity. This is shown by the fact that no lime and soda were deposited, while probably some was taken up from the granite, inasmuch as some alteration is still visible, although relatively weak; furthermore, the abundance of rhodochrosite in the border zone indicates the probable presence of alkaline carbonates.

Deposition of Copper

While these early solutions contained some copper, as is shown by its presence in the oldest known quartz-pyrite vein material, and in the disseminated pyrite of the altered granite, there were apparently no copper minerals deposited in quantity during this period, except possibly chalcopyrite, as mentioned. Enargite was deposited in the Anaconda veins after they were well formed, but before the Blue fissures appeared. Enargite is, therefore, regarded as a relatively high-temperature mineral, but is probably formed under less alkaline conditions. Copper was probably present in excess, or arsenopyrite would have formed in the cooler regions. The alkalinity of the solution prevented the formation of chalcocite. Some bornite was probably formed. During the later stages, when the Blue and Steward systems were formed, enargite, bornite and chalcocite were deposited in large quantities, both in the Blue and Steward veins, and in the older already formed Anaconda veins as well. In all these veins, however, the same order of deposition is noted: Pyrite, quartz, enargite, sphalerite, bornite and chalcocite.

The common Butte metals, such as iron, copper, zinc and manganese, are soluble in solutions of sodium sulphide, but hydrogen sulphide, when present in sufficient quantity, acts as a precipitant. Thus it is probable that chalcocite especially, was deposited only when the hydrogen sulphide was present in high ratio to the alkaline sulphides.

Summary of the Process of Formation

In conclusion, it may be stated that the original source of the Butte ores was the granite magma which gave rise to the quartz-porphyry dikes and that the solutions followed the intrusion of the granite by these dikes. Heated waters and gases carried the metals to their places of deposition. Most of the metals found in the veins were present in the original solution, but others were added by extraction from the wall rock. This process of extraction, tending to vary the chemical composition of the solutions, is an important factor in the distribution of the different ores. The change in chemical composition was first an increase of alkalinity through reactions of hydrogen sulphide with soda and lime minerals in the granite, and later a decrease of alkalinity when the granite became insulated from the action of the solution by altered layers along the fissures. The presence of chalcocite in the highly altered areas only suggests that the more highly acidic conditions were necessary for its deposition. Similarly, the deposition of enargite is governed by the conditions of temperature and relative alkilinity in the solutions. The increasing abundance of sphalerite, rhodochrosite and galena, toward the peripheral zone, suggests their formation under conditions lower in temperature but of high alkalinity. Quartz and pyrite are abundant everywhere, but pyrite is more common in the central and intermediate zones. Quartz is more prominent as a gangue mineral in the peripheral zone. There is no good evidence to show distinct periods of mineralization; the process should be considered as taking place in one period, but with intensity varying.

The Metric Carat of 200 Mg. will soon be almost universal in all dealings in precious stones. The latest country to adopt it is Belgium, where it is authorized from Sept. 1, and will be obligatory after Jan. 1 next.

Minerals of the Tres Hermanas District

By W. Rogers Wade*

Twenty-one miles due south of the town of Deming, Luna County, New Mexico, and seven miles west from Tomberlin, on the branch line of the El Paso & Southwestern R.R., rising from the level plain, are three peaks called the Tres Hermanas. These mountains are composed of a medium-grained granitic rock, showing porphyritic structure, probably a quartz-syenite porphyry. This rock mass was intruded through a fossiliferous limestone series, belonging to the Mississippian (lower Carboniferous) age. The principal ore deposits occur on the northern side of the mountains in this limestone series, which forms gentle rolling foot-hills. On the southern side of the mountains is an area of altered andesite and gabbro. Some copper carbonate and silicate ores have been found here.

The first production of the district came from small fissure veins in the granite porphyry. The Cincinnati mine was the most important producer, having yielded $100,000 or more in silver-lead ore, running high in gold. On the nearby Hancock claim, a 400-ft. shaft was sunk and several thousand tons of rich lead ore shipped.

The principal deposits of economic value are zinc ores, occurring in the metamorphic-limestone area on the north side at the base of the mountains. Here a hard, blue limestone is underlain by a bed of white crystalline limestone which is composed of remarkably coarse calcite crystals and looks exactly like rock salt. These beds dip 10° to the northwest. The metamorphic area extends along the northern side of the range in crescent shape, having a length of 4000 ft. and a width of 3000 ft. at the widest point. Metamorphism has been strong along the contact and is marked by garnet bands. A hundred feet away from the contact the garnets disappear and the only metamorphic mineral in the crystalline lime is wollastonite.

Zinc ores occur in the crystalline-limestone bed around the border of the granite-porphyry intrusion and extend back about 2000 ft., as exposed by the present workings. The limestones are cut by a series of north and south fractures, along which there has been faulting, the greatest throw noted being 75 ft. vertically. They are also cut by a series of east and west fractures, and a series of northeast and southwest fractures. The fracturing is extensive, but practically no faulting has occurred except that caused by the north and south fractures.

Zinc occurs in vertical veins mostly in the north and south and the northeast and southwest fractures, and as bedded deposits extending several hundred feet to each side of the fractures along the bedding planes. They also occur as fillings in old caves and water courses. The deposits were originally operated for lead ores and the zinc was not recognized until 1905.

The zinc ores so far found are all oxidized and were probably derived from blende. Most of the zinc ore developed is in two rare zinc minerals, namely willemite (zinc orthosilicate) and zincite (red oxide of zinc). Willemite is the more abundant. Hemimorphite, smithsonite and hydrozincite are also present in the ore. The occurrence of willemite and zincite at Tres Hermanas is of con-

*Mining engineer, Tyrone, N. M.

siderable mineralogical interest, as they are rare zinc ores and are found in abundance in this country only at Franklin Furnace, New Jersey.

All the mine workings so far are confined to surface pits and shallow underground rooms, following the ore out along the bedding planes. With the exception of one inclined winze 150 ft. long and sunk at an angle of 30°, and one vertical shaft 100 ft. deep (still in crystalline lime), none of the workings extends below 20 to 30 ft. The orebodies so far stoped consist of flats of ore replacing limestone along the bedding planes. These flats start at points where the vertical fissures cut the limestone and extend out along the bedding planes for a distance of 200 ft. or so from the fissure. The ore is a replacement of the crystalline lime and the flats have an average thickness of 2 to 6 feet.

The majority of zinc outcrops are in a semi-basin area covering about 75 acres, scattered over which are 23 groups of quarries, underground rooms, shallow shafts, and nondescript workings. The dumps at these workings represent about one-third of the total material broken, the remainder having been shipping ore, or being left as walls underground to support the roof. There are 4000 tons of material left on the dumps which will average 12.2% zinc. The shipping ore ran from 36 to 41% zinc.

There has never been any intelligent development undertaken in the district. The crystalline lime exposed is only the top of the bed. If this crystalline limestone is identical with the zinc-carrying limestones of Kelly in the Magdalena Mountains, as it appears to be, the lower portion of the bed should be prospected by shafts and drifts or by drilling. At Kelly, the important orebodies occur in the crystalline limestone below the Silver Pipe bed. This Silver Pipe is a narrow bed, about 4 ft. thick, of hard, blue-gray limestone, occurring about the middle of the crystalline series. At Tres Hermanas no attempt has been made to develop any ore except that in the flats at the top of the crystalline bed, directly under the overlying limestone. The latter has been largely eroded and has left the ore exposed on the surface. The property is now idle, as with the present price of zinc the ore cannot be mined and hand-sorted at a profit. The wagon haul to the railroad costs $1.50 per ton and freight to the zinc smelters is $4.50 per ton.

Mineral Production of the Philippines

The following figures for the mineral production of the Philippine Islands in the year 1912 have been compiled and are published in the official *Journal of Science* at Manila:

Products	Quantity	Value
Metallic:		
Iron, metric tons	141	$24,636
Silver, fine ounces	7,121	4,322
Gold, fine ounces	27,582	570,212
Non-metallic:		
Coal, metric tons	2,720	10,100
Clay products	....	226,500
Lime	....	46,013
Sand and gravel	....	234,375
Stone	....	325,524
Salt, metric tons	19,147	287,255
Mineral water	....	27,925
Total		$1,756,872

The total value shows an increase of $343,667 over that for 1911. The larger part of the gain was in the gold output.

Food Supply for Mining Engineers

By Dwight E. Woodbridge*

Coming out even is the great desideratum for prospectors and camping parties, and it is seldom that these parties so provide themselves with supplies, that at the close of their work there is a balance in what is remaining. The following proportionate list of supplies has been found to work out successfully by actual experience in a good many out-of-the-way regions, and is given in the hope that it may benefit some intending traveler in the roadless wilds where mining engineers sometimes go. It is based on what is required for one man per month, and multiplication or division will square it for any-sized party for any length of time:

SUPPLIES	Lb.
Flour, cornmeal, hardtack, rice, grits, oatmeal, or similar foods, at least two-thirds of which should be flour arranged for self-raising	42
Clear mess pork, bacon and ham, say one-half pork	27
Beans and split peas, two-thirds beans	7
Sugar	5
Evaporated fruits, mostly apple	4
Butter	3
Canned milk	2
Cheese	2
Tea, coffee and chocolate	2
Salt, pepper, celery salt, mustard, two-thirds salt	3
Baking powder, if self-raising flour is not used	1

This equals 3.3 lb. per man per day; it may be changed if the work is in a region where eggs, fresh vegetables and milk are to be found, or where game is plentiful, in which case the bacon and ham can be cut a little and the salt doubled, and a few onions, evaporated vegetables, capsuled soups, etc., may be added. These are of trifling weight and are palatable. I have found the "George Washington" coffee to be convenient, or better still, a certain coffee that is made in London, in which the coffee and the milk are combined. A little bottle of lime juice is of importance where one is away from fresh foods. There should also be a couple of pounds of soap, and four or five candles, preferably of the type called "carriage candles." These last need not be increased as the number of men in the party is added to.

United States Barytes Production

Crude barytes was produced in the U. S. in 1912 to the extent of 34,478 short tons. This was a decrease of 967 tons from the previous year's production, but an increase of $30,521 in value. Average price in 1912 was $4.09 per ton, according to the U. S. Geological Survey.

Of refined barytes, 38,225 short tons were reported sold. This movement is also a reduction in tonnage and an increase in value. Most of the barytes is obtained in Missouri, Tennessee, Georgia, North Carolina and Virginia.

Barytes, or heavy spar, occurs in veins as a gangue of metallic ores and also in veins in sandstone and limestone, or as a replacement of limestone. It is used principally as a pigment in mixed paints and in the manufacture of lithopone. It is also used in the manufacture of rubber goods and some wall papers. Its use is reported in Italy as a covering for Gorgonzola cheese. It also forms a useful admixture for many white powdered materials where a cheap, heavy adulterant is needed.

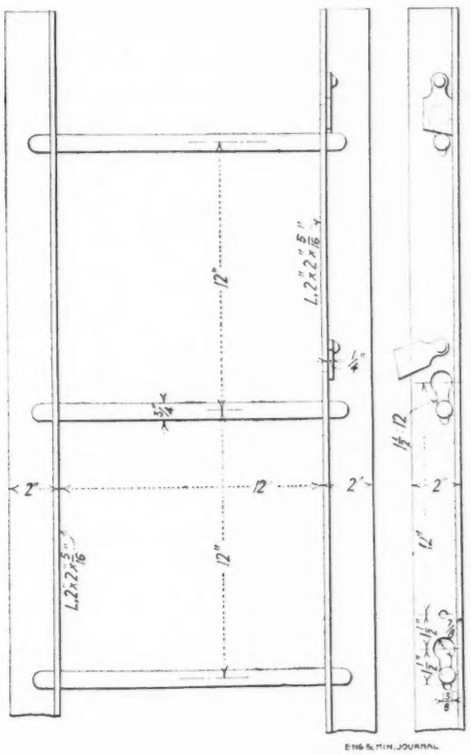
*Mining engineer, Duluth, Minn.

DETAILS OF PRACTICAL MINING

Isabella Knockdown Iron Ladder

By Leo H. P. Kneip*

The ladder shown herewith is one which is being installed in the new steel and concrete shaft of the Isabella mine, at Palmer, Mich., operated by the Cascade Mining Co. The ladder was devised by Francis H. Tippett, as a result of a competition promoted by the superintendent, Thomas J. Nicholas. The ladder uprights are 2x2-$\frac{5}{16}$-in. angles, the rungs are $\frac{3}{4}$-in. iron. The rungs



Isabella Knockdown Ladder

are inserted through $\frac{7}{8}$-in. holes in the angles and drop into a taper slot cut downward from the hole. A pair of grooves in each end hold the rung in the flange against turning and also brace the angles against side motion. The rung is locked in with a swing lug having a beveled bottom, as shown. If a rung should break, a new one can be inserted without taking down the ladder or springing it. The ladder contains no threads, bolts or nuts and can be made without special tools in any mine shop.

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The Crushing of Pillars at the Mt. Morgan Mine in Queensland, acording to the annual report for 1912 of the Under Secretary for Mines, is largely avoided by mining the pillar section soon after the room. It was found that when the room section advanced too far ahead of the pillar that the latter was crushed, so as to render subsequent mining and filling operations extremely difficult. In some cases the room and pillar are removed concurrently.

*Cascade Mining Co., Palmer, Mich.

Safety Rules—Storing and Thawing Explosives*

(1) A magazine shall be provided for the storage of high explosives where more than a supply to last 72 hr. is kept on hand.

(2) This magazine shall be not less than 300 ft. distant from the shaft, adit, habitation, public highway, public railway, thawing house, or mine buildings. Where the distance between magazine and thawing house is less than 1000 ft., a barrier should be provided.

(3) The magazine should be provided with a ventilator at the roof, should have matched flooring, and shall be lighted from the outside only. The presence of any form of light or fire within a magazine is prohibited. Where steam or hot-water heat is used, wooden grates should be provided to prevent explosives coming in contact with hot pipes.

(4) A thermometer should be provided in magazine and thawing house.

(5) The magazine shall be waterproof and covered with a fireproof and bulletproof material.

(6) A lightning conductor supported on a vertical post standing clear of the magazine and not nearer than 18 in. to one of the walls thereof and rising at least 6 ft. above the highest point of the magazine should be installed. It should be carried to a properly laid earthplate, set in the ground below the permanent moisture line of the ground and at a distance of at least 1 ft. outside the walls of the magazine.

(7) "No Smoking" signs and "Dynamite" signs shall be placed on all magazines and thaw houses.

(8) All thawing of dynamite should be done in one of two ways: In a properly constructed thaw house by approved methods; or in a water-tube heater by means of warm water, no hotter than the bare hand can stand. Direct heat is not permitted.

(9) In all places where more than 100 lb. of dynamite or other high explosive is used daily, a thaw house shall be erected for this purpose. The heating apparatus of the thaw house shall be so arranged that the temperature cannot rise higher than 80° F. even if neglected.

(10) Where small amounts of dynamite are used, the thawing shall be done in a water-tube thawer.

(11) The thaw house may be heated only by hot water, steam or exhaust steam.

(12) Drawers in thawers should be changed at least once a year and oftener if they show signs of being saturated with nitroglycerin.

(13) It is forbidden to thaw dynamite on heated stoves, rocks, brick, metal, in an oven, near a steam boiler or fire, over steam or hot-water pipes or by any other method than those provided for above.

(14) While thawing, high explosives are extremely sensitive and should be handled with great care.

(15) Where high explosive for the use of not more

*From Inland Steel Co.'s book of rules.

than one gang of miners is stored not less than 50 ft. from any other powder or high explosive, a supply sufficient to meet the requirements of the succeeding 72 hr. may be stored in a mine, provided that caps are not kept in the same place with the explosive.

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Choice of Mining Methods on the Mesabi

The orebodies of the Mesabi range are essentially flat deposits, of great area as compared to their depth. Taking the whole range into consideration, it may be said that they are generally less than 200 ft. thick, with a maximum of 500 ft. ("Mining Methods on the Mesabi Range," a paper presented at the Minnesota meeting of the Lake Superior Min. Inst., August, 1913). There are three general methods in use at the present time in mining these orebodies, viz.: (1) Underground mining, the ore being mined by hand and hoisted through a shaft and the underground openings supported by timber; (2) openpit mining, where the material above the orebody is first removed and the ore then mined by steam shovels and loaded direct into standard-gage railroad cars; (3) milling-pit mining, a combination of the two former methods, the material above the orebody being first removed, after which the ore is mined through underground openings and hoisted through a shaft.

The selection of the method of mining to be adopted involves a great many considerations and calls for experienced engineering and business judgment. Regardless of the method to be adopted, its selection should be preceded by thorough drilling to determine the limits and size of the orebody and the grades of the ore. Maps showing the top and bottom contours of the ore, and cross-section maps showing relative thickness of stripping and ore are indispensable.

In general, underground methods are used for those orebodies lying under slates or taconite, or deep glacial drift. It is an alternative method, adopted only when the other two methods are out of the question. About the only consideration in its favor is that production can be obtained quicker and with less initial cost than with the other methods.

Openpit mining is used for the larger bodies of ore lying under comparatively shallow surface material and in cases where the operating company is able to make the large initial expenditure in stripping. Besides permitting the lowest operating cost, it has many other advantages. The capacity for production from an openpit is enormous as compared to a shaft. One 40-acre tract operated as an openpit, provided the approach can lie on adjoining land, with two shovels and five locomotives, can send forward 9000 tons daily, while the same area, operated as an underground mine, hoisting through one shaft, would ordinarily produce about 2000 tons daily.

The milling-pit method is adopted generally for the smaller bodies of ore lying under comparatively shallow surface material. The amount of initial expenditure for stripping is much less than for an openpit, where the cost of the approach is a large item. The cost of production from a milling pit lies between that of openpit and that of underground mining.

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Underground Blacksmith Shops

The idea of sharpening drill steel underground has always made more or less of an appeal to mine managers, and there seems a tendency lately to overcome the attendant difficulties, taking precautions against the dangers which may arise and to use underground shops to an increasing extent. In the *Compressed Air Magazine*, August, 1913, Ward Blackburn gives examples of several underground blacksmith shops and enumerates the advantages in their use.

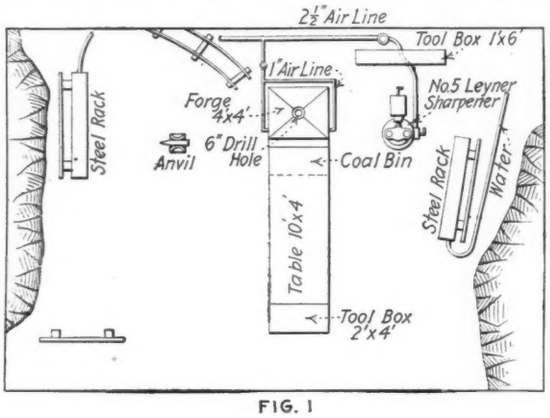


FIG. 1

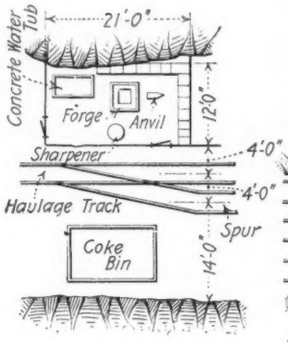


FIG 2

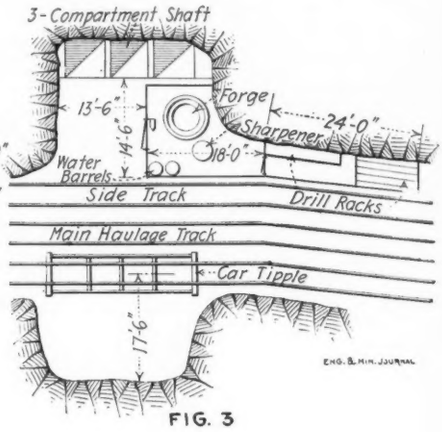


FIG. 3

UNDERGROUND BLACKSMITH SHOPS

The chief advantage is that transportation costs are reduced to a minimum. Getting steel from a surface blacksmith shop to the stopes underground is always a source of worry and expense. With shops located on the principal levels, hoisting and lowering are reduced to a minimum, and, if necessary, as in taking care of isolated stopes or levels, it can be conducted through openings not used otherwise. Another important factor is localization of sharpening. When different kinds of rock occur in different parts of the mine, it is of considerable advantage to vary the heat treatment of the steel to suit the various rocks. This is difficult to accomplish in one central shop, but it is relatively easy where several shops are placed at strategic points underground. It is an advantage to bring the blacksmith into more direct contact with the drill runners, thus keeping both up to their work and if it is easier for the drill runner to obtain his steel, there is less time lost, due to a lack of the proper lengths or

gages. A more frequent turnover of the steel is possible and thus work may be carried on with a smaller stock. A blacksmith underground is available for incidental repair work and odd jobs. Finally, there is the element of safety. It is always a possible source of danger to hoist and lower steel in a shaft, and the manner of doing so is commonly prescribed in efficient mining regulations.

To install a shop underground, provision for ventilation must be made; for this reason a situation near a disused upcast shaft is ideal. A light, compact sharpening machine and an oil-burning forge offer peculiar advantages for underground work. The oil furnace being more easily controlled emits less obnoxious fume and consequently is safer. First-class lighting must be provided. For this purpose, either acetylene lamps or tungsten electric lights are satisfactory, since either gives a light suitable for judging the color of the steel in its heat treatment. When a machine sharpener is used, its exhaust provides ventilation to a certain extent, and helps to cool the shop.

Figs. 1, 2 and 3 show typical underground installations. That of Fig. 1 is for the Davey mines of the American Zinc, Lead & Smelting Co., at Carterville, Mo. Ventilation is obtained in this case by means of a 6-in. drill hole from the surface and a temperature of 67° F. is maintained underground. Fig. 2 is the underground shop at the Joker mine, of Witherbee, Sherman & Co., Mineville, N. Y. The temperature here is said to be about 60°. In Fig. 3, representing the shop at the Barton Hill tunnel property, a temperature of 70° is obtained, although a coke forge is used. In both these latter two stations, air circulation is maintained through a shaft near-by. Incandescent lights are used for illumination, a lamp being placed directly over and in front of the crosshead of the sharpener so that the operator can watch the forming of the bits.

Cleaving Granite with Compressed Air

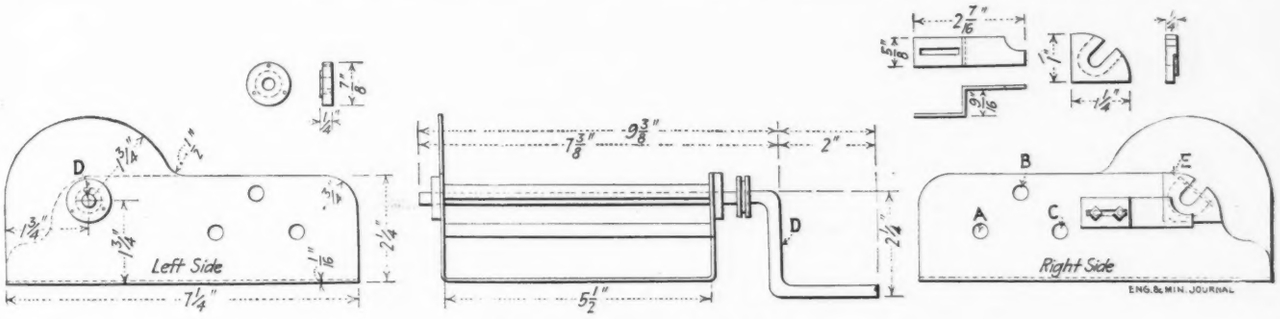
Powder and compressed air are used by the North Carolina Granite Corporation for cleaving off horizontal layers of granite, at Mount Airy, according to *Mine and Quarry*, July-August, 1913. The granite forms a low hill, and the method of removing it consists of drilling a hole 3 or 4 in. in diameter, to a depth of 5 or 8 ft. in the center of the sheet which is to be lifted. The bottom of the hole is enlarged to a pocket with half a stick of dynamite. A handful of powder is then exploded in the pocket, which starts a horizontal crack out into the granite.

Charges increasing in size are set off in the cavity, the drill hole being plugged at each blast in order to confine the gases and thus exert a more constant force upon the stone. When the cleavage has extended to cover a circle 150 or 200 ft. in diameter, a pipe is cemented into the hole by the use of melted sulphur and is connected to the compressed-air line. Air at 70 or 80 lb. is gradually admitted and rapidly extends the cleavage until it appears upon the side of the hill in a thin edge. A sheet several acres in extent may be raised in this manner, leaving an excellent parting to which the quarrymen can work. Away from the edge of the hill the cleavage plane may not come out on the surface, and in this portion it is reached by the use of quarry bars or drills in the usual manner, the extent of the cleavage being determined by striking the surface of the stone with a sledge.

First-Aid Bandage Roller

By E. W. R. Butcher

The accompanying sketch shows a bandage roller used by the Republic Iron & Steel Co. in its first-aid work. The different classes are required to do practice work in their course of training and the ordinary method of rolling bandages by hand was found too tedious for the large number which had to be rolled. This device was designed from a wooden one somewhat similar to it which was being used by one of the range hospitals.



First-Aid Bandage Roller

The bandage to be rolled is brought under rod *A*, over rod *B*, under rod *C*, and given about three turns around rod *D*. The left hand is then placed on the bandage, pressing it against the table to which the roller is attached, and it is rolled to any degree of tightness by regulating the pressure of the hand on the banadage. One edge is kept close to the far side of the frame. It can be removed by taking out pin *E*, which allows crank and rod to come out, and then sliding the roll off the rod.

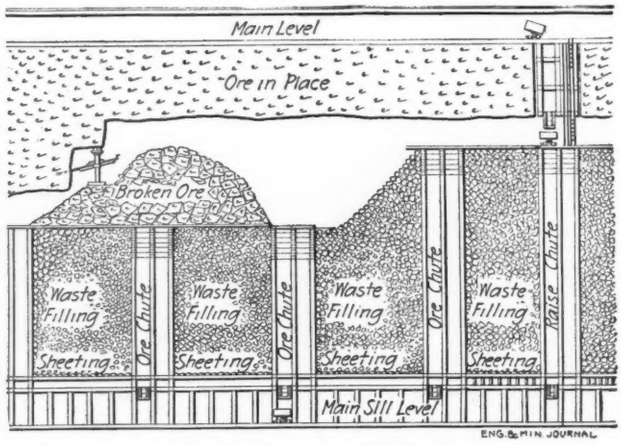
A Stretcher for Carrying Injured Men Safely has been devised, after years of experimentation by Dr. B. F. Stokes, Surgeon-General of the U. S. Navy. It marks an important advance. The stretcher is a basket of heavy iron wires, properly braced, long and wide enough to accommodate a man. The braces also serve as runners when drawing the injured, if that is the only way in which removal can be accomplished. Within the basket a partition extends from the foot and slopes toward the center. This keeps the legs well separatd and affords to each an extra support. Since the majority of accidents needing a stretcher require bandaging of either one or both legs, the advantage of this arrangement is obvious. The stretcher is described in an illustrated bulletin issued by the Kny-Scheerer Co., 404 West 27th St., New York City. The stretcher has found extended use among copper-mining companies.

Butte Back-Filling Stoping Method

The "back-filling" method of mining is employed in the Butte mines whenever the physical conditions of the vein and wall rock are such that it is safe to do so. Both the ore and the country rock must be hard and free from faulting planes. The accompanying drawing gives a general idea of the system.

Its great advantage lies in the elimination of square-sets. From the drift on the vein, a raise is put through to the level above. The ore on the first floor is then mined, and chutes started about every 25 ft. along the drift. Between the chutes, sheeting, composed of small stulls cut in half and resting on timbers a few feet above the drift sets, is placed from the foot to the hanging (A. I. M. E. Bulletin, August, 1913).

Starting from the raise the miners begin to break the ore. After the ore has been broken across the entire face from foot to hanging for a short distance, the miners return, set up their machine on the broken ore, and again



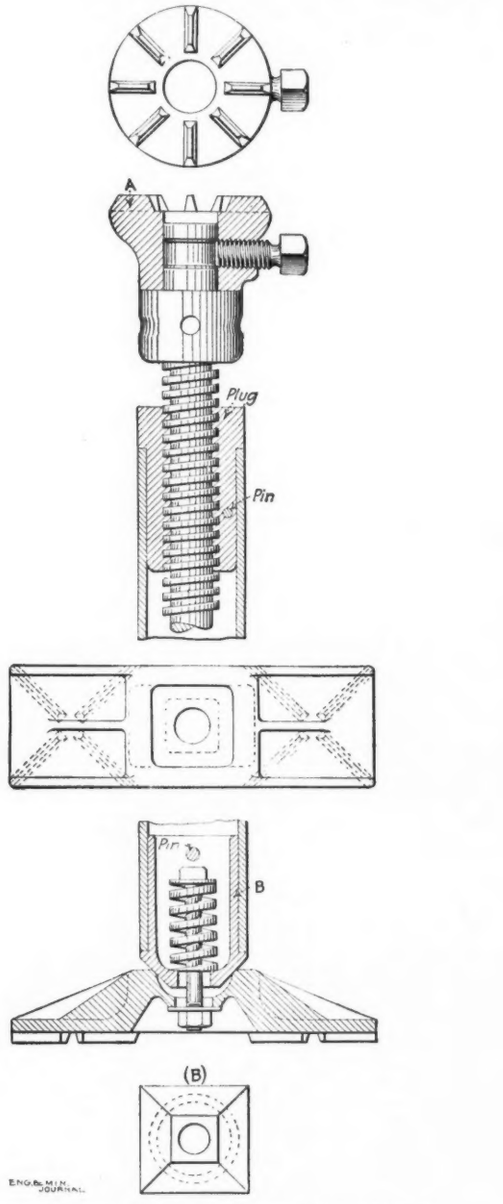
BACK-FILLING AT BUTTE

work their way forward. This is done two or three times until the broken ore is 15 or 20 ft. high; then the miners start again farther ahead and the shovelers begin to muck out the broken ore, shoveling it first into the raise chute, until they reach the next ore chute. When the space between the raise and the first ore chute is clean of ore, a temporary opening is made in the raise chute and waste, dumped into the chute from the level above, is allowed to run through this opening on the sheeting as long as it will. When it will no longer run, a track is started about 6 ft. from the top of the stope, the waste taken from the raise chute in a car and the filling of the stope continued to the first ore chute. The shovelers being now out of the way, the timbermen build up the ore chute one compartment wide and two in length to the level of the waste track, using small round stulls, 6 to 8 in. in diameter. The waste-men then continue filling the stope, following the shovelers.

When the miners have gone as far as the stope is to be worked, they return and start another floor on top of the waste filling, which has been covered with a floor of 2-in. plank to keep the ore clean. If at any time the ground gets heavy, square setting can be started on the waste filling, and this is generally done when the stope has been worked out to within a floor or two of the level above.

Leyner Flexible-Foot Drill Column

A column for rock drills invented by John George Leyner, of Denver, Colo. (U. S. Pat. 1,065,060), is arranged with the telescoping screw at the top and has a foot piece which allows a motion similar to a ball and



SINGLE-SCREW COLUMN WITH ADJUSTABLE FOOT PIECE

socket, thus accommodating itself to a sloping wall or bottom. As illustrated, the column comprises a telescoping screw with an adjustable top piece *A* held on by a setscrew working in a turned recess in the end of the screw. The screw moves in a plug held in the end of the column by means of a pin. The other end of the column contains a plug *B* with a tapered, preferably four-sided, bottom held in a depression in the footpiece itself by means of a bolt and spring, as shown. The footpiece arrangement permits the column to be set at some angle with the wall instead of normal to it.

DETAILS OF METALLURGICAL PRACTICE

Slater Lixiviation Process

A proposed addition to wet metallurgical methods is that of H. B. Slater, U. S. pat. No. 1,066,855, which is designed to beneficiate sulphide ores without previous roasting.

A 15% solution of sodium chloride in water is made, to which is added 1% of iron, preferably as ferrous chloride. This solution is placed in a two-part electrolytic cell, the cathode and anode departments separated by a porous, nonconducting diaphragm. The anode is of graphite; the cathode a copper plate. An electric current is passed from the anode to the cathode, liberating chlorine at the anode and sodium at the cathode. The chlorine combines with the ferrous chloride to form ferric chloride, while the sodium decomposes water with formation of sodium hydrate and liberation of hydrogen. The sodium hydroxide precipitates the iron of the ferrous chloride as ferrous-ferric hydrate. When all the iron in the anode compartment has been raised to the ferric state, a part of the product from the cathode compartment is added to the anode compartment. Sodium hydrate and chlorine will unite to form sodium hypochlorite and sodium chloride. The ferrous-ferric hydroxide will be dissolved by the ferric chloride of the anode solution, forming ferric oxychlorides, which will combine with a part of the chlorine to make ferric chloride. The oxygen liberated from ferric oxychloride, combining with another part of the chlorine and water, will form hypochlorous acid.

In following out this process, care must be taken that at no time may the caustic soda be added to the anode compartment in sufficient quantity to take part in the electrolysis, its office being only that of an agent to react with the chlorine which is being generated at the anode, and not that of an electrolyte.

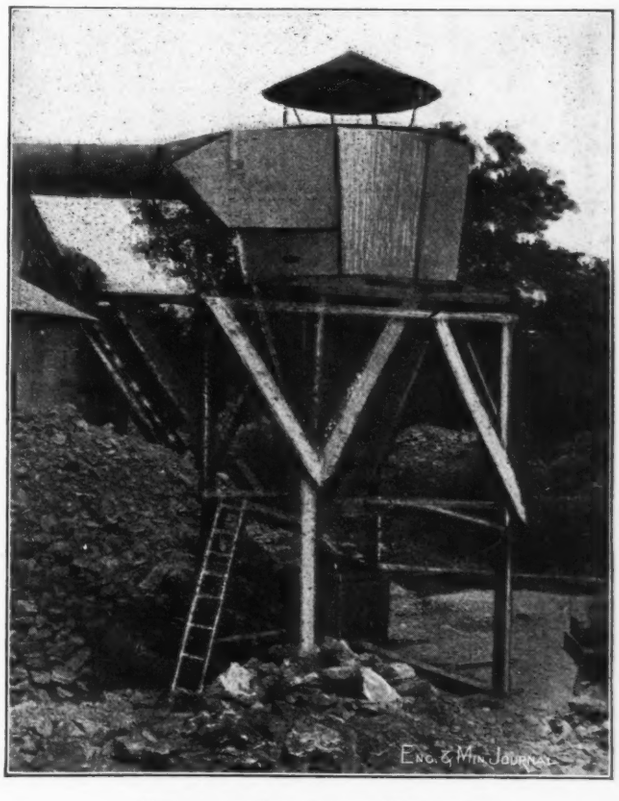
After the iron in the anode compartment has been raised to the ferric state, the continued passage of the current will further enrich the anode solution in higher and more active forms of oxidizing compounds. The chlorine, upon decomposing the water, will combine with the oxygen and hydrogen to form chloric acid and chlorine oxide, which is recognized by its odor and the greenish-yellow foam upon the surface of the solution. When this condition is reached, the solution is ready to be added to the ore for extracting its metal contents.

The ore is to be ground to the necessary degree of fineness and the treatment solution added to it in the proportion of two parts of solution to one of ore, and the pulp agitated. The agitation will bring the sulphur to the surface of the solution and it may be skimmed off. When treating copper ores, the copper will be in solution as cuprous chloride in sodium chloride with ferrous chloride. The hypochlorous acid, chloric acid and chlorine peroxide have oxidized the mineral, liberating the sulphur and allowing the solution of the copper oxide in ferric chloride, reducing the latter to ferrous chloride. Silver will have been converted into sulphide and partly dissolved in the sodium-chloride solution. Gold will have been dissolved by chlorine, but reprecipitated by the ferrous salts, but is in such condition that another treatment with the original solution will bring away all the remaining silver and gold.

Precipitation may be accomplished by passing the solution over iron, removing the copper, silver and gold together. The solution remaining is ready for regeneration for further use in treatment. Or electrolysis may be used for precipitation. This process seems applicable, technically, to copper-gold-silver ores and may, if not valuable *per se*, serve as a hint toward more practical development.

Dust Collector for Dry Concentrator

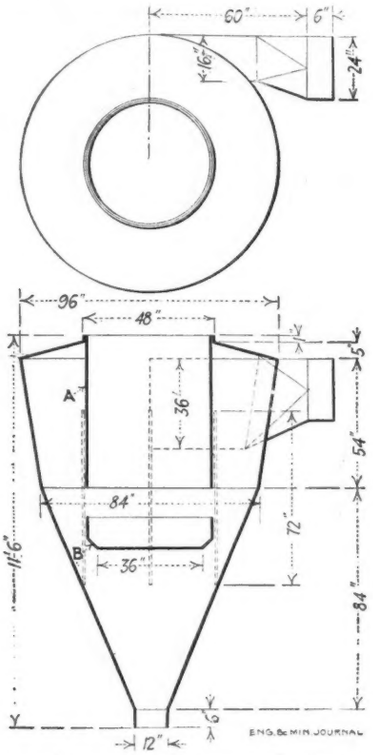
At the property of the Mount Summit Ore Corporation, near Garrison, N. Y., a suction blower has been installed



SETTLING APPARATUS ERECTED

to take the dust out of the crushed ore at various points. The dust is discharged from the blower into the device illustrated. This is a dust catcher of the vortex type, usually applied to planing mills, lumber mills, etc. This is probably the first instance of its use in a dry concentrating plant. The air and dust from the blower enter through the tangential pipe and take a circular path around a collar *A*. This collar is open at the bottom

and the top. The air enters it at the bottom and passes out through it; the dust settles to the bottom of the cone, whence it is removed through a bottom gate, as desired. A dished plate *B* under the collar can be adjusted for height, thus regulating the size of the opening through



PLAN AND VERTICAL SECTION OF COLLECTOR

which the air is discharged. The device is made of galvanized iron and was assembled on the spot by the Buffalo Forge Co. It is reported to be satisfactory in service.

Safety Rules—Structures*

(1) Stairs should not be built at a sharper angle than 50 degrees.

(2) Long flights of stairs should be interrupted at least every 20 ft. with a platform.

(3) Metal stairs with roughed or checkered surface should be provided wherever practicable.

(4) Wherever possible stairs should be provided instead of ladders. Where ladders are used they should be made of steel and securely fastened in position at least 8 in. from wall or column to give room for proper foothold. Where possible stationary ladders should be inclined, and should not extend over 20 ft. without a break.

(5) A hand line, consisting of light rope, should be provided at each ladder to be used in hoisting and lowering material.

(6) Metal points or rubber tips, spurs and, where practicable, hooks shall be provided at ends of portable ladders.

(7) Runways used for walk or wheelbarrows shall be at least 24 in. wide, and cleated underneath. Suitable bracing should be provided, to prevent spreading, teetering or springing.

(8) Cleats shall be provided, to prevent men slipping, wherever practicable.

(9) Railing and toeboard should be provided, wherever practicable, and on all runways that are 10 ft. above the ground.

(10) All platforms shall be provided with railings, toeboards, stairs or ladders.

(11) All permanent railings should be made of metal and properly braced.

(12) Trap doors, manholes and pit covers should be hinged if possible and so constructed that three sides of the hole should be guarded when the cover is up.

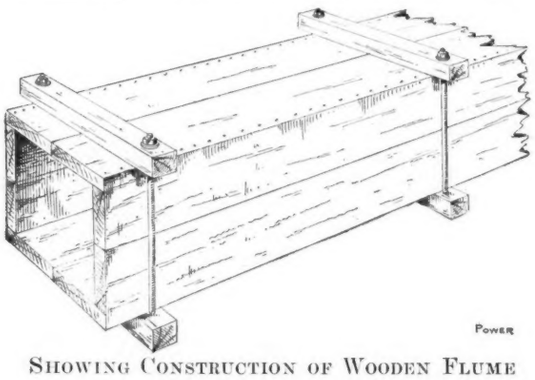
(13) Ladders on smoke-stacks should be guarded, if possible, and rungs should not be attached to the stack, but to side pieces anchored to the stack at regular intervals. To give proper foothold, rungs should be 8 in. from the stack.

*From Inland Steel Co.'s book of rules.

Temporary Wooden Flume Cheaper than Iron Pipe

What seems to be a pipe-line stunt of use to the miner and smelter is described by L. Johnson in *Power,* Sept. 16, 1913.

A New England company decided to build a new penstock and dam for the water end of its power plant, and as the water for the boiler feed, condensers and industrial purposes all came through the waterwheel flume it was necessary to run a pipe line from the plant to above the dam, some 800 ft. Not having permanent use for piping of the size required it was decided to build a flume of



SHOWING CONSTRUCTION OF WOODEN FLUME

plank with the thought that the lumber would be of use after the new penstock was put in operation.

Two-inch planks, 18 ft. long, were used, costing (delivered) $30 per thousand feet. The clamps which held the flume together were 3x4-in. stock, and made of cheap hemlock lumber. The flume was 18 in. high and 16 in. wide. The wooden clamps were put on as shown, and spaced 4½ ft. apart; the rods for the clamps were of ⅝-in. common iron. The discharge end of the flume was connected to the main supply pipe in the basement of the engine room by cutting a square hole in the main pipe to receive the water from the flume.

The first cost of the flume was less than the estimate of a contractor who bid for the job of putting in a cast-iron pipe 18 in. in diameter. After the flume was taken apart the planks were sold in the company's yard for $15 per M., or half the price paid for them.

COMPANY REPORTS

La Salle Copper Co.

The result of operations for six months ended June 30, 1913, at the La Salle Copper Co., Lake Superior copper district, Mich., was as follows: Expense at the mines, $27,836; Eastern office, etc., $2472; construction at mine, $11,655; total, $41,963. From this expense $4108 was deducted for interest and miscellaneous receipts, making the decrease in assets $37,855. Assets reported consist of cash and accounts receivable at Boston, $205,267; cash and accounts receivable at mine, $932; and supplies and fuel on hand at the mine, $1310. Accounts payable at the mine amount to $4704, leaving $202,805 balance of assets at the end of the period.

The water in the mine was lowered to a point below the 17th level. A branch from the Mineral Range R.R. was built to No. 2 shaft. Stoping was begun on a small scale in July. During the period covered by the statement issued by the president it is stated labor shortage seriously delayed the unwatering of the mine and getting the surface equipment in shape for production. The rock will be treated at the Calumet & Hecla mill at Lake Linden. The management hopes to get the production up to the capacity of one stamp. It may be stated that the capacity of the stamps in use at these mills range from 400 to about 550 tons per day, depending whether the feed is conglomerate or amygdaloid.

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Copper Range Consolidated Co.

The report of the Copper Range Consolidated Co., operating mines in Michigan, for the year ended Dec. 31, 1912, shows that 34,584,627 lb. of copper were produced and sold on an average of 16.16c. per lb., making a total of $6,071,095. Interest increased this to $6,084,201. Mine expenses, including smelting, freight, marketing, etc., amounted to $3,661,837, leaving a gross profit of $2,422,364. Taxes, in Houghton County, Mich., amounted to $164,157, leaving a net profit of $2,258,207. To this is to be added the profit earned by the Copper Range Railroad Co., of $103,775, and by the Atlantic Mining Co., $40,386, making a net profit of $2,402,368. From this total is to be deducted interest, taxes and general expenses of the Copper Range Consolidated Co., $83,992, and one-half of the net mining profit of Champion Copper Co., which belongs to the St. Mary's Mineral Land Co., $625,810, making $709,802, and leaving a total net income of $1,692,566 for the Copper Range Co. Dividends paid amounted to $788,428, leaving a surplus of $904,138. 1,784,402 tons of rock were treated, yielding an average of 21.07 lb. of refined copper per ton. The cost of copper produced from the Baltic, Champion and Trimountain mines was 10.51c. per pound.

The reports of subsidiary companies include, first, the Baltic Mining Co., which produced 13,373,961 lb. of copper, sold at an average of 16.16c. per lb. This company shows a net profit of $697,394 for the year. The Champion Copper Co. shows a total of 17,225,508 lb. of copper produced and sold at 16.16c. per lb. The net profit amounts to $1,251,619. The Trimountain Mining Co. shows a production of 6,980,713 lb. of copper produced and sold at an average of 16.16c. per lb. The net profit shown is $308,473. The Copper Range Railroad Co. shows a profit of $103,775 for the year. The Atlantic Mining Co. shows receipts of $131,842 and expenditures of $90,736, leaving net gain from the year's operation, $41,106.

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Greene Cananea Copper Co.

The report of the Greene Cananea Copper Co. for the year ended Dec. 31, 1912, shows that notwithstanding the unsettled conditions prevailing in Mexico during the last year, the operating companies were able to produce at normal capacity for the greater part of the time. Recently, when, owing to the destruction of railway bridges, transportation of fuel and supplies was interfered with, production was slightly curtailed. For this reason, and also due to the somewhat uncertain future conditions, the dividends which would ordinarily have been paid by the subsidiary companies and disbursed to this company's stockholders on May 31, 1913, were omitted. Payment of dividends will be resumed as soon as conditions justify that course.

The company now owns 951,859 shares of the capital stock of the Greene Consolidated Copper Co. out of a total outstanding issue of 1,000,000 shares and all of the capital stock of the San Pedro Copper Co., S. A. Dividends received from the subsidiary companies during the year amounted to $292,025, and dividends paid were $606,668 on March 1, $606,592 on Aug. 31, and $606,918 on Nov. 30. There were 48,157,847 lb. of refined copper produced, together with 1,457,308 oz. of silver, and 7197 oz. of gold. The combined net income was $2,580,749. The average price received for copper was 16.0194c. per lb., and the average cost of producing it, after deducting values of precious metals and miscellaneous revenues, was from the mines of the Cananea Consolidated Copper Co., S. A., 10.31c., and 11.53c. from the mines of the San Pedro Copper Co., S. A.

On April 1, 1913, James F. Douglas was appointed general manager of all the companies' properties, succeeding Dr. L. D. Ricketts. Doctor Ricketts still retains the position of president of the Cananea Consolidated Copper Co., S. A.

The Cananea Consolidated Copper Co., S. A., produced 40,966,018 lb. of copper, which was sold at an average price of 16.0009c. per lb., the gross operating profits for the year being $2,280,799, after charging off expenses for improvements of $152,647. Dividends amounting to $1,500,000 were paid during the year by the Cananea Consolidated Copper Co., S. A., to the Greene Consolidated Copper Co., and the following dividends were disbursed to the shareholders of that company: Jan. 23, 60c. per share, $600,000; Aug. 30, 40c. per share, $400,000; Nov. 29, 40c. per share, $400,000; a total of $1,400,000.

There were 895,406 wet tons of domestic ore and 219,127 wet tons of foreign ores treated, together with 47,017 wet tons of Miami concentrates. There were 547,025 wet tons of domestic ore milled and 143,931 wet tons of foreign ore. The ratio of domestic ore concentrated was 3.157 tons into one and the corresponding ratio of foreign ore was 4.877 tons into one. The silver produced in bullion from domestic ore was 972,723 oz., and from foreign ore, 484,584 oz. Gold in domestic bullion amounted to 4528.86 oz. and that from foreign ore, 2668.3 oz.

During the year there were 72,403 ft. of development work done, of which 1392 ft. were shafts, 13,293 ft. were raises and winzes, and the rest drifts.

The cost of mining for the Cananea Consolidated Copper Co. for the year was $2.93 per ton, as against $2.46 for the previous year. This is partly accounted for by the increased amount of development work.

The San Pedro Copper Co., S. A., mined 215,300 tons of ore, treated 211,206 dry tons and concentrated at a ratio of 4.877 tons into one. The production of fine copper was 7,191,829 lb.; of silver, 484,584 oz.; and of gold, 2655.642 oz. The recovery of copper was 34.05 lb. per ton, or 1.703%; of silver, 2.29 oz., and of gold, 0.0126 oz. per ton. The cost of mining per wet ton was $2.80. The gross cost of producing copper, f.o.b. Cananea, was 14.740c. per lb., which, together with freight and export tax, refining, marketing, etc., amounting to 1.730c., makes a total of 16.470c. per lb. total cost of copper sold. The credit for precious metals of 4.9175c. and miscellaneous of 0.0175c., total of 4.93c., reduces the total cost of copper to 11.535c. per lb. The total development work at the San Pedro Copper Co., S. A., was 232 ft. of shaft, 3132 ft. of winzes and raises, and 9634 ft. of tunnels, drifts and crosscuts, a total of 12,988 ft. for the year.

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Osceola Consolidated

The annual report of the Osceola Consolidated Mining Co., Lake Superior district, Mich., states that an operating profit of $1,163,289 was made on 18,413,387 lb. of copper at an average price of 16.52c. per lb., after crediting interest and silver sales to the amount of $30,411. The company sold stock holdings and real estate aggregating $46,786, making its total net income $1,210,075, from which three dividends totaling $1,153,800 were paid, leaving a surplus of $56,275 to be added to quick assets. The net balance of quick assets at the end of the year was $1,888,458. The dividends of the company to date (1878-1912) amount to $11,170,100. The mill treated 1,246,557 tons of rock, from which 24,282,312 lb. of mineral averaging 75.83% fine copper was produced.

The average yield of rock stamped was 14.8 lb. per ton in refined copper. Mining, transportation, stamping, and taxes cost $1.23 per ton of rock stamped or 8.34c. per lb. of copper; construction, 0.95c. per lb.; smelting, freight, commissions, Eastern office, etc., 1.07c.; total, 10.36c. per lb. of copper. The Tamarack mill stamped 77,937 tons of rock for the Osceola at a cost of 24.32c. per ton. Of the ore hoisted 1.955% was discarded by hand sorting, compared with 1.518% in 1911. The increased percentage in 1912 is due to the reopening of the Osceola branch.

At the Osceola branch 115,551 tons were stamped at a cost of $1.65 per ton for all expenses up to and including stamping. The net yield was 12.80 lb. of copper per ton at a cost of 14.55c. per lb., excluding construction. At the North Kearsarge branch 672,231 tons were stamped at a cost of $1.25 per ton for mining, transportation and stamping. The ore yielded 12.81 lb. of refined copper per ton at a cost of 11.44c. per lb., excluding construction. At a point about 1700 ft. north of No. 4 shaft the 8th level drift encountered a heavy flow of water and shortly afterward a second flow, with large quantities of sand, took place. This required the building of a concrete dam 900 ft. from the shaft and the abandonment of the balance of the drift. For the first six months of the year the copper contents of the rock from this branch was only 11.88 lb. per ton. At the South Kearsarge branch 458,651 tons were stamped at a cost of $1.04 for all expenses up to and including stamping.

The ore yielded 18.15 lb. of refined copper per ton at a cost of 6.79c., excluding construction. Fully two-thirds of this tonnage was mined from the foot-wall. This rock consisted in part of vein matter which extended back into the foot-wall, and in part of foot trap which was found to contain copper. It is hoped that a large part of the old stopes can be worked over in this way.

After two years' experiments with various types of drilling machines, the Leyner-Ingersoll one-man drill has been adopted as a standard, and these machines are being introduced as fast as practicable. The results are an increase in the wages of the miners and a decrease in the cost of drifting and stoping. Including 59 ft. of shaft sinking the development work at the three branches totaled 7130 ft. The depth of the shafts at the end of the year follow: Osceola branch, No. 5 shaft, 4623 ft.; No. 6 shaft, 4592 ft.; South Kearsarge branch, No. 1 shaft, 2820.5 ft.; No. 2 shaft, 1992.5 ft.; North Kearsarge branch, No. 1 shaft, 3873.5 ft.; No. 3 shaft, 3251 ft.; and No. 4 shaft, 1449 ft. from the surface.

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Ohio Copper Co.

The report of the Ohio Copper Co., Bingham mining district, Utah, for period Aug. 1, 1912, to Dec. 31, 1912, states that 234,239 tons of ore were mined and concentrated. Operations were only carried on for about 3½ months of the five-month period on account of labor troubles in September and October. Metal production amounted to 2,343,439 lb. of copper, 1920 oz. of silver and 380 oz. of gold in concentrates shipped to smelter. The operating profit on this production was $104,935 from which sundry other expenses are deducted, leaving a net profit of $88,181. After allowing for smelter losses this would indicate a profit of a little less than 4c. per lb. of copper or a cost of something over 11.5c. per lb. of refined copper.

Mill unit No. 2 was ordered dismantled and the Wall rolls removed and reconstruction of this unit was not completed at the end of the year. The two units operated treated an average of about 2000 tons of ore per day, with the third in operation the daily capacity is expected to reach 3000 tons. The company ended the year with $281,208 cash, $273,127 accounts receivable and $122,986 accounts payable, and $1,246,000 of bonds outstanding, with $514,000 worth of bonds in the treasury.

Influence of Flat Dike on Ore Formation

By E. A. Colburn, Jr.*

SYNOPSIS—Dikes in Cripple Creek are intimately associated with ore deposits. Usually acted as dams to solutions. A permeable, basic dike, in this case, was intersected by an ore channel and conducted the solutions to form a distinct oreshoot at some distance to one side on the vein. One of the rare Cripple Creek cases where the faulting can be measured.

In the Cripple Creek district dikes are regarded with a great deal of interest because of the relation existing between them and the ore-bearing veins. The theory is that most of the dikes, being more impervious to percolating solutions than the country rock, act as obstructions to the flow of the gold-bearing solutions and thus allow time for the replacement of the surrounding country rock and the precipitation of the precious metals at or near their walls. Conditions tending to prove this theory may be found at many places in the district; oreshoots are found on the walls of nearly vertical phonolite and basic dikes, and flat dikes or sills are often known to be accompanied by ore where intersected by vertical or nearly vertical veins, the larger bodies of ore lying in or above the dikes. There is reason to believe, however, that the deposition of the ore on the dikes is limited to their intersections with oreshoots, other parts of the vein along its intersection with the dike being barren. Other dikes, however, mostly basic, being soft and easily permeable, act as channels for the movement of solution and are often replaced and mineralized by solutions derived from veins which cross them. A rather unusual occurrence of this type may be of interest and is therefore described.

Breccia Country and Flat-Basic Dike

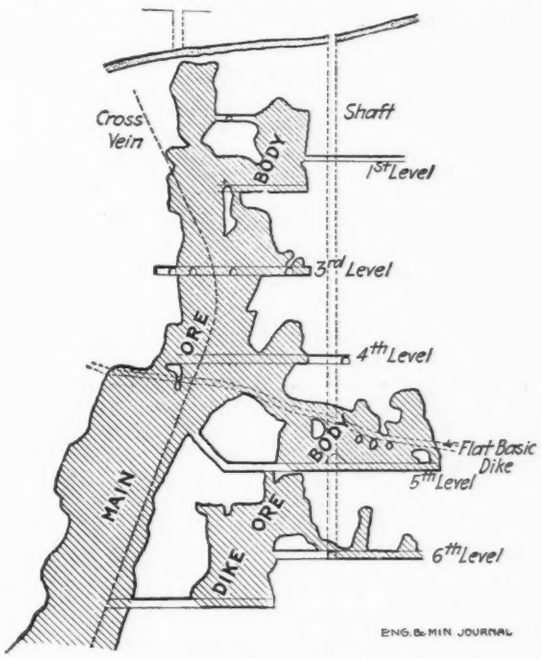
The country rock through which the vein and dike in question pass is volcanic breccia, showing fragments of andesite, phonolite, granite and other rocks, enclosed in a bluish groundmass and lying in pronounced strata which have a strike of about N30°W and an extremely flat dip to the south. These strata are from 4 up to 6 ft. thick and are usually of varying hardness, which accounts for pinches and bulges in the vein as it passes through them.

The accompanying figure shows a projection of the vein on a vertical plane N 10° 30′ W and also the position of the dike intersection in relation to the vein. The dike is a soft greyish-white trachy-dolerite locally called basalt. The strike of the dike coincides with that of the stratifications of the country rock, and its dip is also in conformity being approximately 18° south. The intersection of the vein and dike slopes a little to the south from the main oreshoot and seems to mark the lower limit of the oxidized zone, nearly 500 ft. below the surface.

A Fissure Vein Faulting the Dike

The vein is a narrow fissure, having a width of 2 to 6 in., according to the character of the layers of breccia it traverses, striking N10°30′W and dipping about 70° south. It marks the position of a fault plane in which slickensides on the walls indicate that the movement was nearly vertical. Sheeting at various places in the vein often reaches the width of 2 ft. and is always on the foot-wall side of the fissure, never in the hanging wall. The fault has a normal throw of about 4 ft., a rather unusual occurrence for the Cripple Creek district in that faults are rare and seldom intersect dikes or other formations by which the throw can be measured.

The vein follows the fault plane closely and is filled with a fine, gray sand containing fluorite and quartz and often giving away entirely to bunches of these minerals which show crystals of calaverite and sylvanite in the vugs and cavities. Fluorite, as a rule, does not carry



Vertical Projection of Oreshoots

well in gold if the tellurides are not visible to the naked eye, and the ore in this vein is no exception. The more compact, even-grained fluorite and quartz does not seem to contain the amount of gold that the more coarsely crystalline varieties do, and seldom runs more than $2 or $3 per ton.

Two Oreshoots

The principal oreshoot in this part of the vein may be seen, by reference to the projection, to pitch slightly to the north in the vein below the fourth level and to be nearly vertical from that point to the surface. This shoot has been mined to a depth of more than 1000 ft. on the dip of the lode and was not bottomed at that point, thus showing a continuity far beyond that of most of the oreshoots of the same size in the district.

A crossvein, having a course of about N30°W, intersects the oreshoot of the vein from the lower levels almost to the surface, and was originally thought to have influenced the position of the shoot, but later developments

*Superintendent, Ajax Gold Mining Co., Victor, Colo.

proved this to be improbable, since the intersection leaves the shoot at its northern edge a little way above the 200-ft. level and carries no ore at its intersection with the vein at any point above. It is true that when the intersection is in the shoot the ore is richer and wider than at any other point, but this is probably due to the greater fracturing of the country rock, which would allow better replacement and mineralization.

The flat dike seems to have the same effect upon the oreshoot as does the crossvein, in that at its intersection the ore is of a better grade and is of greater extent than at other places.

The ore to the south of the main oreshoot may be described as the dike orebody, since the dike seems to have been the principal cause of its deposition. The ore does not extend more than 20 ft. above the dike at any point, and is connected with the main oreshoot only by a small amount of ore along the dike, a stringer that could have easily been overlooked by any other than an observant miner. The workings south of the shaft on the fifth level, which were at some distance from this connection, did not disclose any high-grade ore; this was also the case south of the shaft on the sixth level.

The better grade of ore was found between the dike and the sixth level at the north end of the shoot and almost directly below the connection between the two shoots. This ore was bottomed about 70 ft. below the sixth level, and as considerable work has been done at a still deeper level, and no ore found in the fissure, it is highly probable that ore will not be found at any greater depth upon the projection of this orebody. A glance at the projection will show the reader the spotted and irregular character of these shoots, a condition common to most of the Cripple Creek deposits, especially in the smaller veins.

The dike oreshoot is nowhere connected by pay ore to the main shoot except as mentioned above, and in all probability could not have derived the solutions, which made the ore, from any other source than the dike, as the fissure between the two orebodies is so tight as to be almost indistinguishable. The solutions circulating in the main ore channel of this vein, in either ascending or descending currents, as the case may have been, probably worked along the dike and percolated downward on the vein a little way south of the main channel, thus producing rich ore at points in the fissure where fracturing and the porous condition of the walls allowed free access to the solutions.

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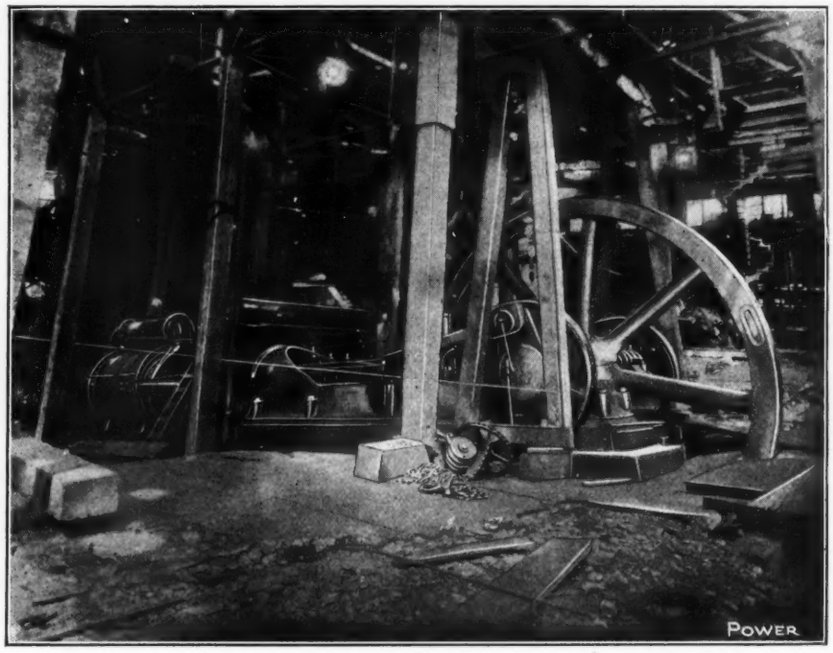
Power Generation and Hydraulicking are accomplished with the same water at the Pioneer tin mine in Tasmania. The powerhouse is situated 300 ft. above the mine ("Mining and Engineering Review," Australia, July, 1913) and generates electric current by the means of impulse turbines operating under a head of 189 lb. per sq.in. During the six months ended Dec. 31, 1912, the mean power load was 482 kw. The power is transmitted at 6500 volts to the mine, and the water after leaving the turbines is conveyed 4¼m. to a point 240 ft. above the mine, where it is available for use in the pipe lines to the hydraulicking giants. The electric power is used for drainage and for elevating.

Settled Ten Feet but Kept on Running

In the JOURNAL of Aug. 16, 1913, reference is made to the subsidence of the blowing engine of the United Verde Copper Co. A fuller description of the engine and its troubles is given in *Power,* Sept. 16, 1913, by T. Peacock, from which the following notes were taken:

The blowing engine used for furnishing blast to the copper converters at the United Verde Copper Co.'s smelting works at Jerome, Ariz., is a cross-compound engine with duplex air cylinders, built by the Southwark Foundry & Machine Co., in 1902. The steam cylinders are 28- and 52-in. diameter by 60-in. stroke, while the air cylinders were originally 96-in. diameter.

In November, 1910, the air cylinders were changed to 60 in. At that time the engine was slightly out of level, but it was urgently needed, and there was no time to level it up. The cause of the engine being out of level was the subsidence of old mine workings under the power house, and several other large blowing engines and compressors were also more or less out of level. The Southwark engine was got ready for work in January, 1911, and was put on continuous 24-hr. service.



ENGINE STILL RUNNING AFTER SETTLING FROM A LEVEL 2 FT. ABOVE THE CHALK LINE

Shortly after the engine was started the subsidence of the power house increased to an alarming extent, the concrete floor and walls of the building cracking in several places. A boiler room containing 16 Scotch marine boilers stood next to the power house and the caving area extended under the boilers, causing considerable trouble from leaking steam pipes and connections.

It was then decided to move the whole of the machinery and boilers from the area of subsidence to a new site as quickly as possible. New compressors for the mine, driven by electric motors, furnished with power from a hydro-electric power plant were installed and it was only necessary to set up 10 of the Scotch boilers. These were moved to safe foundations, along with two Allis blowing

engines for converter work. A new steam turbine-driven turbo-blower large enough to furnish blast for all the converters was ordered. Meanwhile another large Nordberg blowing engine was wrecked by the subsidence, and it was necessary to keep the Southwark blowing engine running constantly at a reduced speed, in conjunction with the Allis engines, in order to furnish sufficient blast to keep the plant going at two-thirds of its capacity.

The Southwark engine was run steadily until Mar. 26, 1912, when the new turbo-blower was put in operation, and it was kept in running order until Apr. 17, when the work of moving it to a new foundation was begun. It was run for a short time as late as Apr. 12, and during several months it was stopped only occasionally for a few hours to lengthen the steam, exhaust, or air-discharge pipes between the point of suspension on the roof of the power house and the engine, as the subsidence under the engine was greater than under the walls of the building, necessitating swing joints in the pipes to take care of the constantly increasing distance between the main pipes and the engine, in addition to the occasional insertion of 12 or 15 in. in each pipe.

The photograph was taken on Apr. 16, 1912, the day before the engine was dismantled for removal. The white line is a chalk line exactly level and set two feet below the original level of the floor.

The length of the engine is 41 ft. 9 in. from end to end of the bedplate, the width overall of the two bedplates being 19 ft. 6 in.

The crank end of the foundation had sunk 5 ft. 1 in. and the cylinder end was 9 ft. 9 in. below the original level, the difference in level over the length of the engine being 4 ft. 8 in. The shaft was 3 in. out of level, while the piston rods of the air cylinders were only ¾ of an inch different in level, the low-pressure steam side being down in both cases.

The engine foundation was one solid block of masonry with concrete top, the only opening in the foundation being a narrow pit for the flywheel. It is probably due to this solid form of foundation that the engine was kept running under such extraordinary conditions, as all the other engines in the same power house had separate foundations under each side of the engine, and most of them moved out of parallel during the subsidence, either by the separate foundations coming together or moving apart, a result which experience showed could not be prevented by any amount of timber struts or tie-rods.

Electro-Metallurgy of Zinc

For the chloride of zinc, hitherto usually employed in the electro-metallurgical processes of zinc recovery, G. Gallo substitutes fluoride, obtained by the action of fluoric or silicofluoric acid upon oxide of zinc (*Min. Journ.*, Aug. 16, 1913). Mixed with half its weight of chloride of sodium the fluoride of zinc can be melted undecomposed. The molten mass is able to dissolve a fairly large quantity of oxide of zinc. If the mass is subjected to electrolysis at 3 volts with carbon electrodes the metal is recovered (extraction about 70%) mostly as a molten layer at the bottom of the electrolytic cell. Trials on a large scale have given relatively good results. The metal obtained from four parts of oxide of zinc and one part fluoride was fairly pure, and could be further refined in the usual metallurgical way. The results would be even more favorable if the ores were previously treated by calcination and electro-magnetic reduction.

Progress on Minnesota Steel Co. Plant

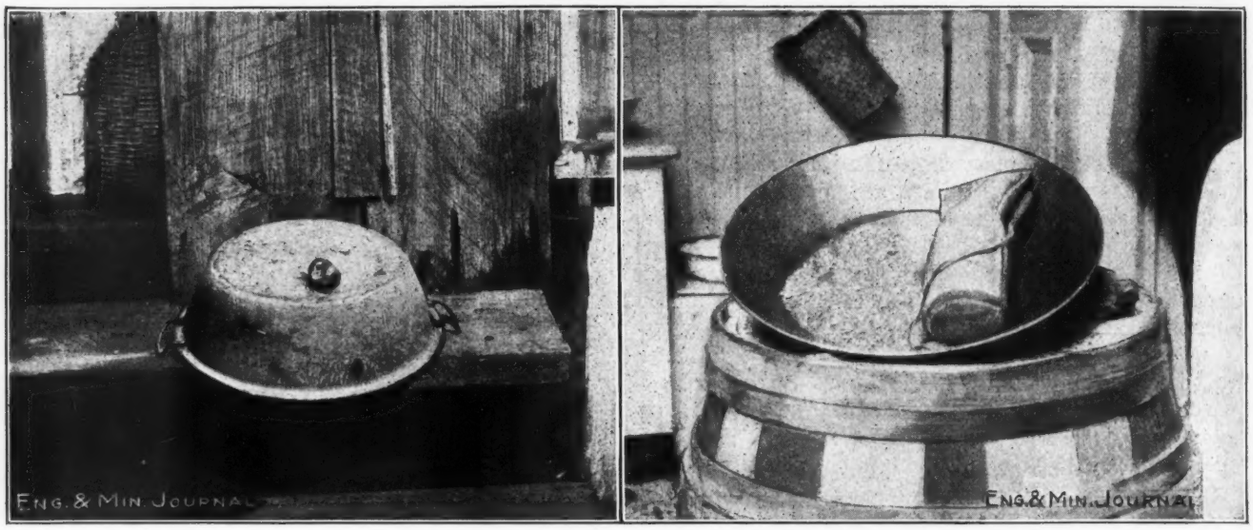
The plant of the Minnesota Steel Co., a subsidiary of the United States Steel Corporation, is being built at the head of Lake Superior, near Duluth and Superior. It has been under construction for nearly four years, but it will be another year and a half before it is ready for operation. It is to be a much more extensive works than when originally projected. When it goes into commission it will embrace two blast furnaces of 500 tons daily capacity each; 90 byproduct coke ovens; 10 openhearth furnaces of 75 tons capacity each; one 40-in. reversing blooming mill; one 28-in. finishing mill; one 16-in. continuous roughing train with three-stand, 12-in. finishing, two-stand, 10-in. finishing and two-stand 8-in. finishing rolls; power house of 10,000-kw. capacity; 5 gas-driven blowing engines of 20,000 cu.ft. capacity each; a pumping station of 40,000,000 gal. daily capacity; machine, forge and structural shops; three reheating furnaces, designed to use 16-ft. billets, with a daily capacity of 1000 tons of ingots, and a cement plant of 4000 bbl. daily capacity.

The plant is on Spirit Lake, a widened basin of the St. Louis River, nine miles from the union station at Duluth. The site embraces 1500 acres, with two miles of water front. With the exception of those to house the cement plant, most of the buildings are now inclosed. All of the structures, which are of enormous size, have steel frames, the walls being of two-piece concrete blocks. The machine shop is in full operation, turning out work for the builders; the blast furnaces are nearly ready for the linings; the great engines are on their foundations and will soon be fitted out; the openhearth furnaces are all in place, but the big rail, plate and bar mills are without machinery. There have been vexatious delays in procuring material and equipment, deliveries having been slow. There has been an improvement of late, however, with the result that much larger construction crews are now employed and the work is progressing at a satisfactory rate.

The company is just beginning the erection of dwellings for its employees. Present plans call for the construction of 175 two-apartment houses, but these will be only a small portion of the dwellings that will be required. At present, with the exception of part of the laborers, who are camping in the neighborhood of the plant, and the executive force, who live in cottages on the shore of Spirit Lake, all the men engaged in the construction work are taken to the plant on the Northern Pacific Ry. from West Duluth and Duluth in the morning and are taken back at night. The Minnesota Steel Co. has itself built a belt line, connecting the plant with every railroad entering Duluth and Superior. A great transfer bridge, of steel, spans the St. Louis River from the Minnesota to the Wisconsin shore at "New Duluth" and another of similar kind is contemplated.

In 1912, 10,536 Square Sets were Erected Underground in the Mt. Morgan mine in Queensland, Australia, according to the annual report of the Under Secretary for Mines of that state. Of these sets, 10,302 were filled in, the total quantity of waste used as filling being 105,600 tons, about 10 tons per set. During this period, the quantity of ore obtained from the underground working was 193,476 tons, almost 19 tons per set.

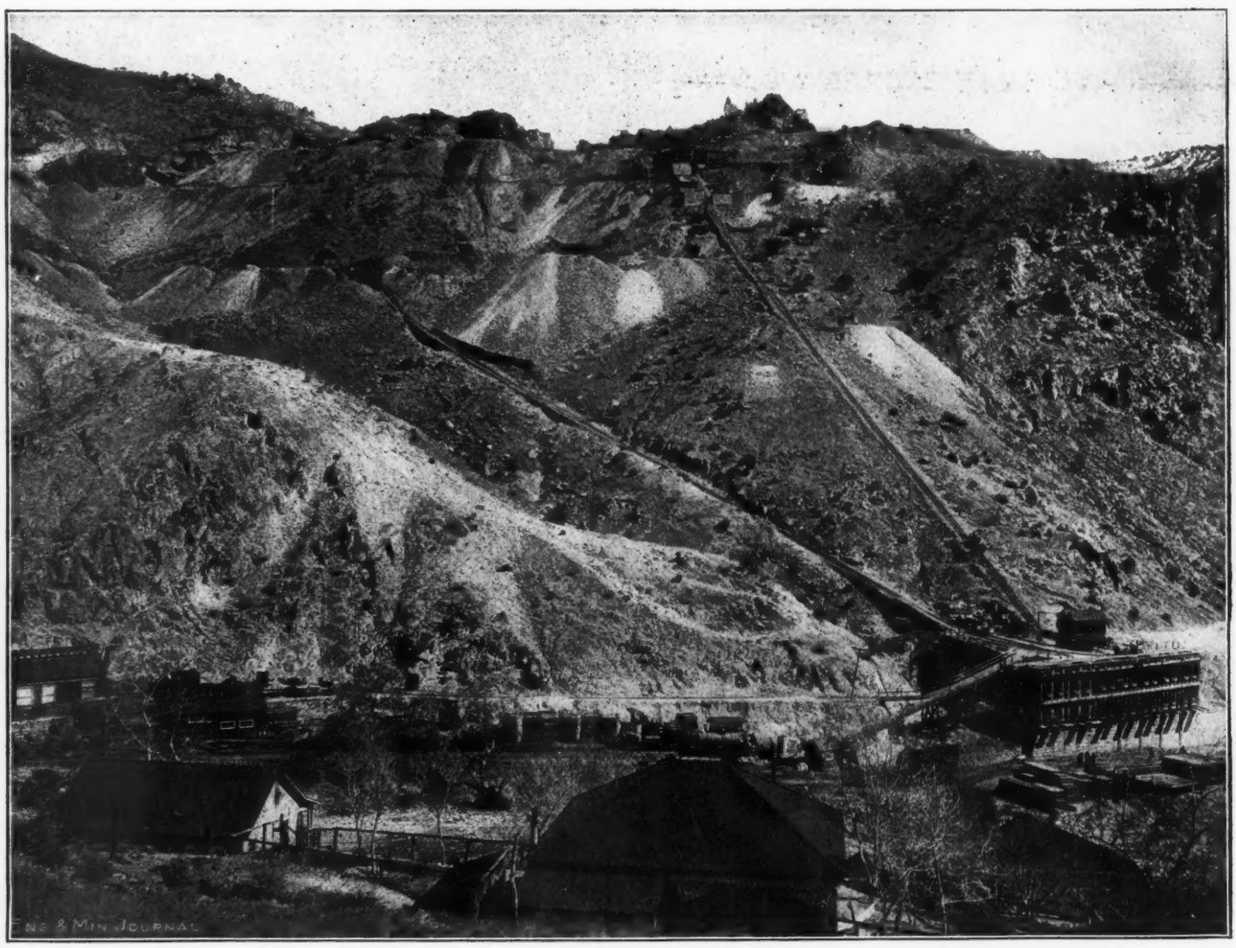
PHOTOGRAPHS FROM THE FIELD



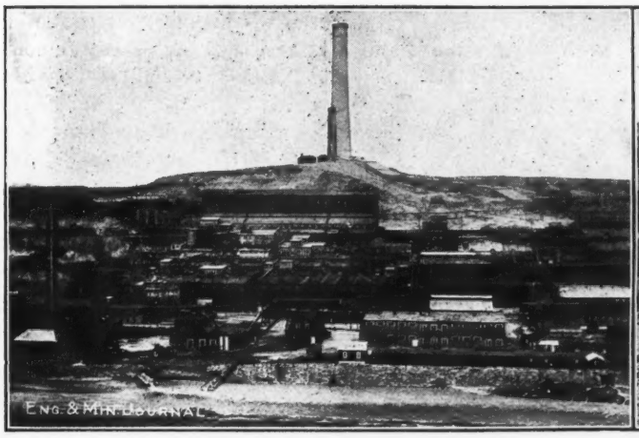
GOLD FROM CALIFORNIA AND FROM ALASKA

From Mineral Slide mine, near Magalia; weight, 10 oz.; worth $183; found Aug. 2.

From Discovery claim, Chathenda Creek, 200 oz. worth $3200 brought to Dawson, July 23.

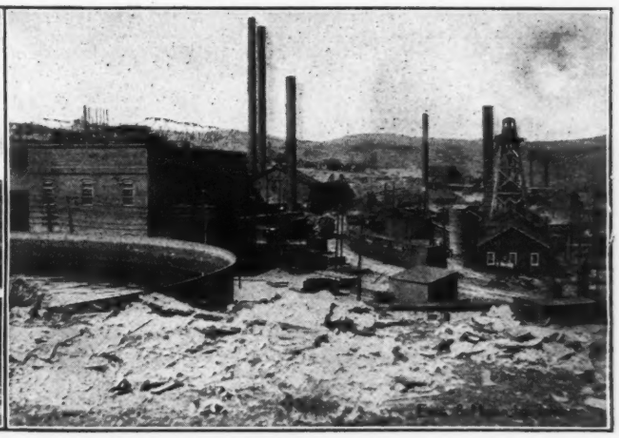


METCALF AND WILSON INCLINES, OREBINS AT BOTTOM, METCALF, ARIZ



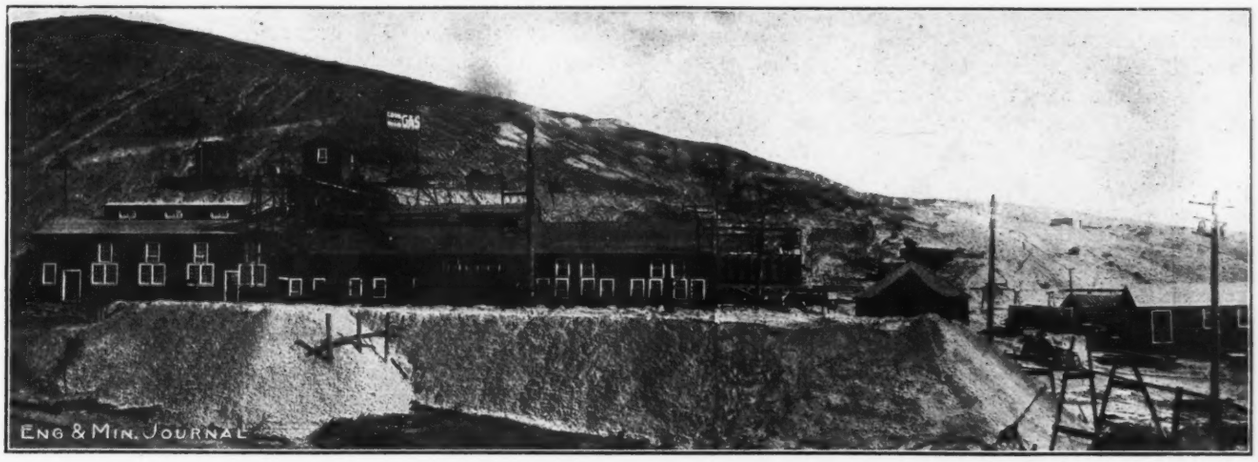
REDUCTION WORKS AT GREAT FALLS, MONT.

View taken from opposite side of the Missouri River. In the center of the picture the 220-ft. chimney is shown standing beside the newer 506-ft. stack.

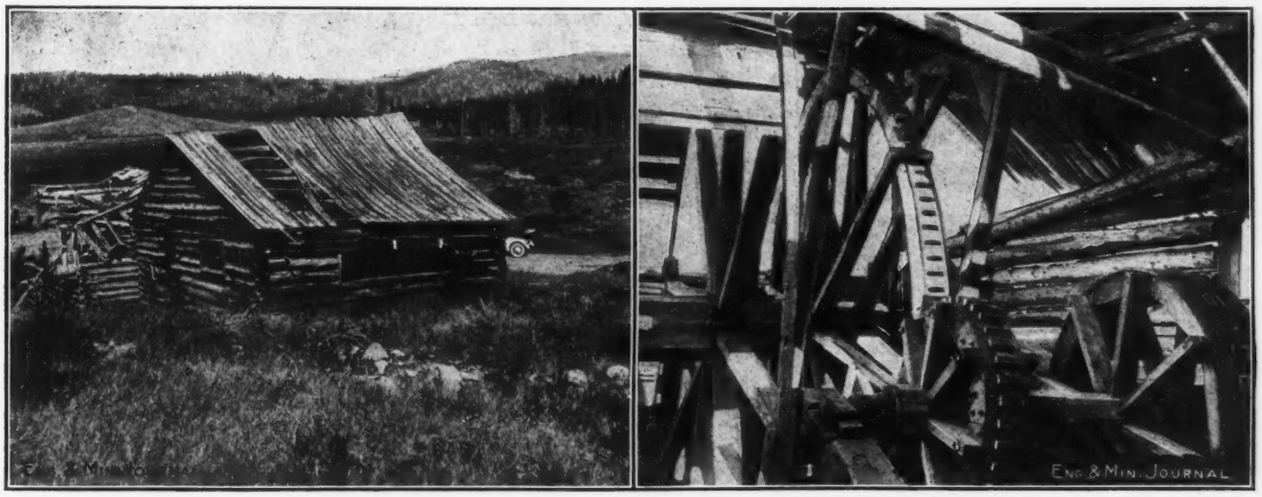


HIGH ORE MINE, BUTTE, MONT.

In the shaft, copper glance was lately encountered at a depth of 3270 ft., the deepest occurrence of that mineral yet known at Butte.



BUTTE & DULUTH LEACHING PLANT, BUTTE, MONT.



THE OLD CAMERON STAMP MILL, NEAR PHILIPSBURG, MONT.

At the left, view outside of the building; at the right, view of part of the interior, showing especially the driving machinery (water power). The building is wholly a construction of logs and in the interior most of the parts, moving and otherwise, are of wood. The mill dates back to the '60s. It is one of the historic mining relics of the state. Steps ought to be taken to preserve it.

Experiment in Smelting Titaniferous Magnetite

By L. O. Kellogg

A real test on titaniferous magnetite will be run early in the coming year; it is planned to smelt 30,000 tons of the Adirondack high-titanium ores. The McIntyre Iron Co. owns what is probably the most extensive and richest deposit of this nature in the Adirondack region, at Tahawus some 30 miles north of North Creek, the end of a branch of the Delaware & Hudson. The company already has ordered or has delivered on the ground sufficient machinery for erecting a separator capable of treating 24 tons of crude ore per hr. This material will average about 49% iron and about 20% titanic acid. With the magnetic separator it is planned to take out the magnetite proper and discard the nonmagnetic ilmenite so as to obtain a product running between 56 and 60% iron and 9 to 12% titanic acid. This concentrate will be transported to North Creek by logging locomotives of the caterpillar type, hauling trailers over the snow, and thence be taken by rail to Port Henry on Lake Champlain. The McIntyre company has there leased the local furnace for a sufficient period of time to permit of the completion of its experiment.

The method of work will be to begin with a mixture of the titaniferous concentrate and ordinary magnetite, in the ratio of about 1:7, and increase the proportion of the refractory material until it is no longer possible to smelt. Just how high a ratio can be handled is a question, but it is a fact that slags running as high as 4 or 5% titanic acid are not uncommon, and it seems reasonable to suppose that this can be substantially increased when the matter has been studied.

It is interesting to note what has been done along this line previously. At the Tahawus deposit between 1843 and 1857 there were built three charcoal furnaces. The last of these, still standing, is a substantial structure of stone, lined with firebrick and sandstone, 42 ft. high with a 3½-ft. hearth and a 9-ft. bosh. This furnace ran for 18 months, and during that time must have smelted a considerable amount of ore, but just how much and what the results were, is unknown, since all records have been lost. It is known, however, that part of the product was used to make crucible steel. Rather recently the owners of the Tahawus deposit sent 700 tons of the crude ore to the Bethlehem Steel works, and as a result were offered a contract for 3,000,000 tons, which, however, they did not feel like accepting because of certain contingent conditions. It would appear, however, that the Bethlehem company was sure of its ability to smelt such ores. It is stated that some time ago the Colorado Steel & Iron Co. by mistake bought some 10,000 tons of titaniferous magnetite, which was piled for discard when its true nature was discovered. However, a mistake was made in the weight of another lot of ore of entirely different nature, which ran a number of tons short when cleaned up. In order to take care of the discrepancy, the furnace man ran in the titaniferous material, and so far as known no difficulties were encountered. The work of Rossi in smelting titaniferous ores is well known, and it is an unquestionable fact that he made a good fluid slag and a good quality of iron.

The commercial possibilities of this smelting, however, are not yet known, and it is this that the McIntyre company intends to investigate. Nor is it bothered by the fact that in so doing it is pulling the chestnuts out of the fire for the other owners of titaniferous magnetite deposits. It seems to be the general consensus of opinion that the value of the deposits in the Adirondacks has been exaggerated. It is hoped to ship the residue from the separating operation, which will be high in titanium, to Niagara to make ferro-titanium; but under present conditions only a limited amount of this material can be absorbed.

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Gold and Silver Production in 1912

The Director of the United States Mint has issued his corrected figures for the production of gold and silver in the year 1912. In the preliminary estimate given in the Journal for Jan. 11 there was necessarily some uncertainty in the apportionment to the several states, though the totals do not differ largely. As is usually the case, the corrected totals are somewhat higher than the preliminary estimate. The corrected figures for two years are given in the accompanying table.

GOLD AND SILVER PRODUCTION

	Gold, Value		Silver, Fine oz.	
	1911	1912	1911	1912
Alabama	$18,400	$16,400	$200	$200
Alaska	16,665,200	17,198,600	468,300	539,700
Arizona	3,521,400	3,785,400	3,228,900	3,445,500
California	19,928,500	20,008,000	1,270,900	1,384,800
Colorado	19,138,800	18,741,200	7,331,200	7,933,100
Georgia	32,000	10,900	600	200
Idaho	1,357,900	1,401,700	8,184,900	7,862,900
Illinois	.....	.....	4,000	1,800
Maryland	100	1,200	100	700
Michigan	.....	.....	507,700	543,500
Missouri	.....	.....	49,100	30,000
Montana	3,649,700	3,707,900	12,163,900	12,524,000
Nevada	18,096,900	13,575,700	13,185,900	13,851,400
New Mexico	761,700	754,600	1,341,400	1,460,800
North Carolina	71,900	156,000	1,000	2,300
Oregon	634,200	759,700	44,800	54,000
South Carolina	20,100	15,400	.....	.....
South Dakota	7,429,500	7,823,700	200,300	205,800
Tennessee	11,900	11,500	107,000	112,000
Texas	3,900	2,200	444,200	379,800
Utah	4,486,200	4,312,600	11,630,600	13,076,700
Virginia	3,100	300	200	700
Washington	840,000	682,600	230,300	350,800
Wyoming	21,300	24,300	700	300
Continental U. S.	96,692,700	92,989,900	60,396,200	63,761,000
Philippines	195,350	461,608	3,100	5,800
Porto Rico	2,000	.....	100	.....
Total	96,890,000	93,451,500	60,399,450	63,766,800

There was a decrease of $3,438,500, or 3.5%, in the total gold production, which was due to the falling off of $4,521,200 in Nevada. In most of the other states the output was well maintained. The leading gold producers in order were California, Colorado, Alaska, Nevada, South Dakota and Utah.

In silver production there was an increase over 1911 of 3,367,400 oz., or 5.6%. The gain was pretty generally distributed, the only prominent increase being 1,446,100 oz. in Utah. The leading producers in order in 1912 were Nevada, Utah, Montana, Colorado, Idaho and Arizona.

In our insular possessions the Philippines show an appreciable increase in gold, mainly from dredging operations. Porto Rico, which produced a little placer gold in 1911, dropped out altogether last year.

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Reported in New York

It is rumored that the American Smelting & Refining Co. is going into the zinc-oxide business.

CORRESPONDENCE AND DISCUSSION

Social Conditions in the Black Hills

The fact that Lead, S. D., where the Homestake mine is situated, is the see of a Roman Catholic bishop, has been brought before the public since the recent Milwaukee meeting of the Federation of Catholic Societies. Bishop Joseph Busch there made some statements regarding conditions at Black Hills mines which anyone familiar with the district will recognize as totally at variance with the actual state of affairs. Many of them were absolutely untrue, while in others the truth was so grotesquely distorted as to be unrecognizable. The most charitable explanation would be the suggestion that the prelate had been misinformed, but a residence of nearly three years in Lead ought to have been sufficient to put him in possession of the facts in the case.

Locally these statements were at first received as a joke, but when they were printed in various prominent newspapers, and given a wide circulation as the words of a dignitary of the church, amusement gave place to indignation, and the citizens of Lead prevailed upon the mayor to call a mass meeting for the purpose of protesting against such misrepresentation. That this indignation is shared by many members of the good bishop's flock is evident from the fact that one of the clergy resigned in protest at his utterances, and that many of the congregation attended the mass meeting, at which many hundred citizens of all creeds and nationalities were present. After several speeches, a set of resolutions was introduced, denying and condemning the statements attributed to the bishop, and expressing entire satisfaction with the existing conditions at Lead. After one of the leading Catholic citizens had suggested a slight correction, the resolutions were adopted unanimously. A letter of protest, addressed directly to the bishop by the Roman Catholics of Lead, and requesting him to deny the alleged statements, was also made public through the local papers.

The principal bone of contention has been the observance of the Sabbath at the mines and mills. All saloons and picture shows in Lead and Deadwood have been closed on Sundays, but labor has gone on as usual in the mines, except for one shift on the alternate "change Sundays"; baseball games have been a most popular form of Sunday amusement at the municipal park. To both the latter the bishop objected. As a matter of fact, those men who wished to lay off on Sundays in the Homestake mine have for many years had the privilege of doing so, provided due notice were given to the shift boss, but comparatively few have availed themselves of the privilege. Last year the experiment was tried of closing the mine entirely for several consecutive Sundays, but a great majority of the miners objected vigorously to the innovation, and the former system was resumed and is still in vogue, namely, working only one shift on alternate Sundays (change days), there being two 8-hr. shifts on every other day.

It may be added that the fact that nearly 10% of the present Homestake employees have worked for that corporation for over 20 years is not an evidence of their being "practically enslaved," but is a result of their being satisfied with their jobs, and of the policy of not "firing" men who have grown old in the service. A large number of these men own their own homes, and many own other property, Pacific Coast lands and Homestake mine stock being favorite investments.

The free kindergarten and library maintained by Mrs. Hearst, the free hospital system, the recreation building now being erected for Homestake employees and the "aid fund," bear testimony to the interest taken by the company and stockholders in the welfare of the people; while the local banks, carrying nearly $2,000,000 in deposits, are evidence of some degree of material prosperity among the mine workers.

A HOMESTAKE EMPLOYEE.

Lead, S. D., Sept. 8, 1913.

Miners' Strike on Vancouver Island

Some of the statements relative to matters connected with the strike of coal miners on Vancouver Island, British Columbia, published recently in the JOURNAL, are incorrect; others are incomplete.

On Aug. 30, the JOURNAL stated, in part, that:

> At Extension eight buildings, including the tipple and approaches to the mine, are reported burned, also three big motors, 35 cars and considerable equipment. One of the slopes of the mine is on fire, but the fire broke out before the riot.

The only valuable building burned was the superintendent's residence; other buildings destroyed were miners' houses, small and of little value. The tipple was not burned, only the approaches to the mine. No equipment was destroyed other than the electric locomotives and mine cars. There was not, nor is there, fire in one of the slopes of Extension mines.

"At Nanaimo they closed up the office of a newspaper." The *Nanaimo Herald* suspended publication for two days only, as a consequence of violence threatened by strikers.

> Since the strike commenced the Cumberland mines have been operated by the aid of Chinese miners, but fearing race riots, these men are reported to be quitting work. The disturbance is likely to lead to an investigation of the unionists' grievances, which the coal companies have been avoiding and which the provincial government has hitherto refused to grant.

As to Chinese miners—if one will refer to the "Annual Report of the Minister of Mines for British Columbia," 1912, p. K246, he will find a table showing the "number of hands employed" in the Coast collieries for the year, namely, 4720, of which number 4690 were employed at Vancouver Island coal mines, including: Japanese; miners 55, laborers 62; total 117. Chinese: miners 85, laborers 537; total 622. Total Orientals, 739, against 3351 whites, the latter including all white employees of the companies. It should be noted that 416 of the Ori-

entals were employed above ground and but 232 underground, and of the latter 183 were laborers. Prior to the strike the white miners employed the Oriental laborers underground. Five years ago—in 1908—there were employed at Vancouver Island collieries 864 Orientals out of a total of about 3460 hands; ten years ago—in 1903—there were 865 Orientals out of a total of 2993 employed; twenty years ago—in 1893—there were 442 hands employed at the Comox (now Cumberland) mines, and of them 150 were Orientals. It will be seen then that the employment of Orientals at Vancouver Island coal mines is by no means a new departure. It is true that there are now both Chinese and Japanese certificated miners, but there is no law in force in British Columbia, nor has there been, debarring Orientals from mining coal underground after they have passed the examination prescribed by law.

Then as to the investigation of the strikers' grievances—no specific charge has as yet been made by the strikers, nor the agitators who pose as their friends, of any breach of the Coal Mines Regulation Act—only indefinite allegations. Without doubt the provincial Department of Mines will prosecute whenever a specific charge be made of any offense under the act. The government, however, has persistently refused to be made a cat's paw of to settle an industrial dispute. There is a Dominion Industrial Disputes Act, and the Department of Labor at Ottawa is the proper department to go to if it be desired by the strikers that a Board of Investigation be appointed, and that is well known to the strikers and the agitators claiming to speak for them. It is probably quite true the provincial government has refused to grant an investigation, labor disputes not being under its jurisdiction; it is also true that the strikers have not taken the proper steps to secure a full investigation by the Dominion government, though it has all along been open for them to make the usual application for appointment of a Board of Investigation, as provided for by Dominion law.

Finally on Aug. 30 an editorial note was published as follows: "Later advices state that some of the mines are resuming operations, recognition of the union having been conceded." One small company, which in 1912 employed an average of 187 men and produced 88,253 tons of coal, has given in to the United Mine Workers of America. It first told two large companies that if they would lease or sell it some of their coal lands (it has less than 50 acres at Jingle Pot containing coal) so as to prolong its working life, it would stand out with them; if not it would give in to the union. Its conditions were not conceded by its big neighbors, so it accepted the union's terms. The companies that continue to refuse to come to terms with the U. M. W. of A. together employed an average of 3903 hands in 1912 and produced 1,469,955 long tons of coal.

Now as to the incorrectness of the JOURNAL'S news of Sept. 6. The statement that "the Western Fuel Co. is expected to make a similar settlement with its employees" to that made by the Jingle Pot owners is quite at variance with fact so far as the company is concerned, for it persistently declines to have any negotiations with the U. M. W. of A. Neither is it true that "about 200 nonunionists at Cumberland have left, which will reduce still further the limited output which the Mackenzie & Mann mine at that place has been making." The JOURNAL has been misinformed. No such number of men have left the Cumberland mines since the militia was sent to quell the rioters. For several days at the end of August the average output of coal was rather above 2000 tons. Even on Sept. 1, Labor Day, it was about 1900 tons. On Sept. 8, 2290 tons was produced. and on Sept. 10, 2287 tons; the average for the six working days to Sept. 10, inclusive, was 2014 tons. The general average when conditions were normal, before the strike, was only about 2100 tons. Nor has the proportion of Oriental labor employed recently been appreciably larger than in past years.

Victoria, B. C., Sept. 11, 1913. E. JACOBS.

A Home-Made Acetylene Lamp

It is hard to understand the whyfor of the lamp described by A. Livingstone Oke, in the JOURNAL, Sept. 6, 1913. The consumption of so much ingenuity untempered with common sense seems a pity. Heaven knows, the commercial acetylene lamps are bad enough, but their faults lie not so much in their design as in their deplorably flimsy construction. This home-made lamp on the other hand, seems to have been worked out without regard to the purpose for which it is to be used. Thus there is no provision whatever for filtering the gas. Anyone who has used an acetylene lamp knows very well what hob will be raised by a small particle of dirt in the burner. Again, it would take extremely little tipping to spill so much water that that remaining would not have sufficient head to enter the carbide chamber. In the third place, the burner in the center of the top of the lamp casts its light exactly where it should not, namely, in the eyes of the operator, and casts a heavy shadow just where light is wanted, namely, on the bottom. Finally, not only does the manufacture of the lamp involve a large number of soldered joints, a thing which should be avoided, so far as possible, but it would cost, made up in small quantities in a mine shop, several times the price of a better commercial lamp.

New York, Sept. 8, 1913. ROBERT OLDS.

Measurement of Crushing Efficiency

In the JOURNAL of Aug. 23, you comment on the "Measurement of Crushing Efficiency" and say that A. O. Gates advanced a basis for calculations other than that proposed by Stadler and Del Mar. Professor Gates, after extensive testing, came to the conclusion that Rittinger's law, rather than Kick's, applied to crushing, in other words, the work done in crushing was proportional to the reduction in diameter. Now, what I propose is that every mine or mill manager who can possibly do so, will send to the JOURNAL the following data on all crushing machines used in their mills:

(1) Name and make of machine.
(2) Screen analysis of feed.
(3) Screen analysis of material after being ground.
(4) The amount of material ground per unit of time.
(5) The power consumed per ton of ore.
(6) The means taken to arrive at this data.

If the JOURNAL will print all answers, it will have taken the most direct step toward solving this problem.

ALGERNON DEL MAR.

So. Pasadena, Calif., Sept. 2, 1913.

EDITORIALS

Smelting at Miami

It is reported that the International Smelting and Refining Co. will build a smelting plant of about 270,000 tons annual capacity in the Miami district, especially for the treatment of the Inspiration and Miami concentrates. Those two mining companies will nearly supply a smelter of such capacity. This will be a logical development, being indeed one of the things urged when the Miami-Inspiration consolidation was being considered. The Miami concentrates by themselves lack sufficient iron for economical smelting and have to be shipped to Cananea, far away, whence the blister copper has to be lugged back over about the same road. On the face of things this is an economic crime, though under conditions still existing it is inevitable. The Inspiration concentrates probably will be better off in iron, and with them as a nucleus smelting at home will be possible. Presumably the Miami contract with the Greene company will be transferred. The recent concession that Miami is reported to have received, amounting to a saving of ½c. per lb. of its copper, may have something to do with this matter.

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Mine Taxation

The tax gatherer is an official from whom but few persons are exempt, and no corporation. The taxation of mines is a peculiarly complicated problem for reasons so well known that we do not need to restate them. The mine owner is probably no more desirous of being a tax dodger than any other honest person, but no more is he desirous of paying more than his share of running the government, including the political waste, etc.

Mine taxation has recently been a very live subject in several states, including Michigan, Colorado and Arizona. Now it is one of the questions of the day in Montana, where the Anaconda company appears to feel that it is marked for extortion. The newspapers quote a statement by this company that from 1903 to 1913 inclusive the Anaconda and North Butte companies have paid $2,001,504 in taxes in the state on net proceeds of the mines alone valued at $83,053,068. This is about 2½% on the net output. Anaconda's assessed valuation this year is $26,550,000 and its tax in Silver Bow county alone is upward of $350,000. These are big figures, but it is a big company.

Compared with the rate of taxation in the City of New York, where nearly 2% is paid on valuations at 100%, the Anaconda does not seem to be badly off, but of course it does not get the returns in the shape of luxuries that the New Yorker does. Indeed we do not fancy it gets much of anything besides police protection, and the services of the courts when needed. It can not distribute its taxes among other persons in the form of rentals, etc., but has to pay the whole out of its own pocket, i. e. out of the pockets of its stockholders, most of whom live in other states.

However, the whole subject of taxation, whether it be of real estate, personal property, or incomes, is one of the most complicated and perplexing of all socialogical and economic problems. We shall not set out to discuss it lightly.

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The Census Bureau

The letter from our Washington correspondent on another page informs us that the new director of the census, William J. Harris, has appointed a commission to take into consideration the present condition of the statistical bureau of the work. Besides several officers and former officers of the bureau, this commission includes Prof. Walter F. Willcox, of Cornell University. The object is first to consider some plan for completing the unfinished work of the thirteenth census and secondly, to arrange, if possible, for the better organization and administration of the bureau. The former is naturally the most pressing subject of consideration. The law required that all of the work in connection with the thirteenth census should be finished by July 1, 1912, but considerably over a year has elapsed since that time, the work is still unfinished and the regular annual reports with which the bureau was expected to supplement the information collected in the decennial census, have been seriously delayed and in fact have not been completed at all. We need hardly say that the value of the information collected in 1910 and of the supplementary work to be done each year depends largely upon the promptness of completion and publication. Only a short time ago, it seemed as if the work of the thirteenth census would hardly be fully accessible until it was time to make preparations for taking the fourteenth. The new director, however, seems to appreciate the situation and its requirements, and is preparing to bring the bureau under his charge into better condition, and this is a hopeful sign.

Two or three years ago, we heard a great deal of the elaborate card systems devised for compiling the information gathered and of the new and extraordinary machinery which was to be used in preparing this information for tabulation and publication. To judge by the results so far attained, the system and the machinery have been failures, and there is no sign that the work has been done by them more promptly or more correctly than by the agencies employed in previous years. It is quite possible, however, that the defects may have been as much in the manner of using these agencies as in the system itself. The latter is most probably the case; at any rate, it seems to need some investigation, and we think that the public has a right to know why the supposed valuable information, which was collected in the rough, over three years ago, should be still unattainable in concrete form.

One of the departments, or branches, of the census which is still far from finished, is that of mining and quarries. In order to complete this at the earliest pos-

sible moment, the commission recommends that the further work on this branch be abandoned at once and that the tables thus far completed be brought together and published, constituting the final report on this subject. This is probably the best that can be done at the present time.

Without saying anything about the methods of collecting the statistics on the mining industry—to which we have heard serious objections made—it is certainly very much to be regretted that nothing so far has come of all the work done three years ago. The publication of a mass of statistics, which are now promised by the end of the present year, and which relate to the mining industry of 1910, will be of very little actual use or benefit at a time when the substantially correct figures for the same industries for 1913 will be almost ready and when those for 1911 and 1912 are beginning to be almost ancient history. It is too late now to worry much about the figures of the thirteenth census beyond hoping that they may be nearly enough correct to afford some basis for a comparison. It is sincerely to be hoped that Director Harris and his commission will devise a practicable plan for expediting the fourteenth census. Surely if the bureau is put on a practical business footing, we may hope for better and prompter work in the future, and we think that all concerned should be willing to help in bringing about that result. The first step, however, will be to eliminate the political element as far as possible, and to reorganize the bureau into a real working force.

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Transvaal Gold and the Strike

The effect of the miners' strike on the Witwatersrand upon the gold production was hardly as great as might have been expected. Nevertheless, there has been a perceptible falling off in the last three months. Up to the end of May there was a good increase over last year, and the maximum production of 794,306 oz. was attained in the month of May; and this was an increase of about 15,000 oz. over the corresponding month in 1912. In June, there was a decrease from May of 47,259 oz., the total production being about 6000 oz. less than in June of last year. The lowest point was reached in July, when the total output was only 655,389 oz., the smallest recorded for many months and 111,000 oz. less than last year. In August, production rallied to a total of 728,096, which is still 36,641 oz. less than a year ago, but shows a sufficient gain over preceding months to point to further improvement.

The changes were entirely in the Witwatersrand, the outside districts of the Transvaal, showing a pretty steady continuous production running not far from 30,000 oz. a month. The total gold production for the eight months, ended with August, was 6,023,906 oz. this year, against 6,073,982 in the corresponding months of 1912. The decrease of 50,076 oz. will probably be made up in the closing months of the year, but the gain in 1913 over 1912 will undoubtedly be very much smaller than the advances shown in the last three years.

The strike seems to have had some unfavorable effect on native labor, for during the month of August there was a decrease of 12,392 in the number of native laborers employed.

Notes on Copper

There ought not to be any great mystery, respecting the importation of standard copper from England by American refiners. A large part of the copper reported in the European stock is nothing but furnace material, which must be refined in one place or another. Ordinarily it is refined in Europe, but American refiners have bought it and brought it hither for refining in the past and consequently have not lately been inaugurating any new thing. For a long time it has been hoped that there will be more of this kind of trade and some reason to expect it, American refiners being preëminent in their branch of metallurgy. This particular business is, of course, wholly a matter of dollars and cents. The interruption of copper production in Mexico, especially because of the cutting of railway lines, has reduced the supply of crude copper to a considerable extent. Cananea, Moctezuma and Aguascalientes are running well up to their capacity, but not fully, while on the other hand Tezuitlan and some of the smaller producers are idle. All told, there may be a deficiency of several million pounds per month in the Mexican supply.

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Measurement of Crushing Efficiency

The somewhat incomplete condition of the argument referring to systems of measuring and comparing crushing efficiencies has already been mentioned in these columns. On another page we publish a communication from Algernon Del Mar, who suggests a comparison in the JOURNAL, each operator to furnish data of his crushing machines and their work. It appears to us that this suggestion is practical and valuable. The columns of the JOURNAL are always open to this kind of helpful discussion and we hope that the suggestion will be followed.

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The injunction against the Western Federation of Miners, which is now restrained in Houghton county, Mich., from "interfering with, molesting, or disturbing" in any manner the employees of the mining companies will probably break the backbone of the strike. Even if this turns out to be the case, however, it will be many months before the several mines can regain their normal rate of production, very likely not before next spring. Mines have had to be allowed to fill with water, organizations have been disrupted and miners have migrated to other districts, whence they will not easily be drawn back. After a long drawn out strike, there is usually a shortage of labor, whichever side wins, and the coming months of Lake Superior will without doubt bear out the experience elsewhere in the past.

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The New York labor commission has wisely decided to go more slowly in the adoption of new rules and regulations governing mining and quarrying, and consequently postponed the hearing which was scheduled for Sept. 17. New York certainly needs a revised code, but while the authorities are about it they will do better to get a very good one instead of one that is only pretty good. However, they are now proceeding with the right spirit.

BY THE WAY

A recent story in the *Saturday Evening Post* talks about the "school of mines at Boulder." Colorado papers usually placing the University of Colorado at Boulder and the C. S. M. at Golden, please note and resolve to lead a better life.

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"One of the greatest discoveries of science displayed at the International Congress of Refrigeration in Chicago, is that of Dr. Kamerlingh Onnes, who has been making researches into the uses of liquefied gas," says the New York *Sun*. "It is announced that he has produced a temperature of 426 degrees Fahrenheit below zero, within 2 degrees of absolute zero, or the point of absolutely no temperature. With a liquid gas of that temperature, it is declared, the composition of atoms may be determined, and metals lose their electrical resistance, so that minute wires could carry any distance all of the electrical power generated by Niagara Falls." Quite so, and it would appear that the editor's science was nearer to absolute zero than two degrees.

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A prominent Irish mine official in Pennsylvania, whose early education was deficient, but who has made good through the use of great natural intelligence, good judgment, and quick wit, has under his jurisdiction a large mine opened by a shaft, says the *Colliery Engineer*. Some time ago the heavy oak collars originally put in at the foot of the shaft required replacement, and it was decided to use steel beams instead of timber. The mining engineers were busy calculating the size of beams required, and incidentally asked Jim a few questions regarding the condition of the strata to be supported. Finally Jim asked, "What are you doin'?" "Calculating the size of steel beams necessary to replace the oak collars," was the reply. Quick as a flash Jim asked, "Didn't the oak collars hold the load for over 20 years?" "Yes," was the reply. "Thin, what the h— is the use of calculatin', why don't you spicify bames of the same strength?"

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The new crystallography, which, within a few months, has developed into a demonstrated science, is among the most striking of recent achievements. Reviewing the details of progress in a Royal Institution lecture, Dr. A. E. H. Tutton showed the overwhelming evidence that the crystal is a homogeneous structure, made up of simple or complex molecular units that may be considered as points, and of "space-lattices," that may be conceived as unit cells or bricks with imaginary lines in three directions connecting similarly placed points. All crystals prove to be based on eighteen space-lattices and 250 point systems. X-ray photographs of thin crystal sections reveal symmetrically arranged spots, which are reflections of similarly placed atomic points, and indicate the planes of the space-lattice. This has made it possible to obtain angular measurements for 10,000 substances. The descriptions and chemical relations of these have been brought together in a book by Professor von Groth, and Professor von Fedorow has prepared a tabulated reference index for use in crystallo-chemical analysis.

The embers of nearly extinct fires sometimes burst into a last fitful flare. Such happened in Congress, a few days ago, out of the ashes of the silver question. It had developed that the language of the pending currency bill cast a shadow of doubt upon the integrity of the gold standard. Consequently an amendment reaffirming the latter was introduced. Immediately the wild men of Congress rose in rage. A howl reverberated through the hall of the representatives. That eminent economist, Mr. Witherspoon, of Mississippi, charged that the amendment was a "dirty goldbug trick." Mr. Wingo, the distinguished financier, from Arkansas, condemned the amendment as a "useless, childish, futile sop to Wall St." Then someone arose and said that he had talked with Mr. Bryan, and Mr. Bryan approved the measure. A riotous laugh spread over the House. The commitment of William Jennings Bryan to the single gold standard was too much for their overworked risibilities. Opposition subsided except from a gentleman whom the Washington correspondents call "Alfalfa Bill," and the resolution was adopted by a vote of about three to one.

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The estate of the late Peter Kimberly recently paid to W. T. Bailey, of Duluth and Virginia, Minn., $60,000 for five acres of land in Virginia, on the Mesabi range, and thereby hangs a story about the well known Pennsylvania mining man. Mr. Kimberly was a resident of Sharon, Penn., and he left an estate estimated at $11,000,000, a large part of which was won by mining operations and iron land deals on the Mesabi range. One of his transactions was with the Interstate Iron Co., a Jones & Laughlin company, and involved the transfer, among other valuable ground at Virginia, of a certain "40" at the edge of the city and close to the mill of the W. T. Bailey Lumber Co. Five acres of the land within the "40" was owned by W. T. Bailey. In his deal with the Interstate Iron Co., Mr. Kimberly was bound to deliver the land clear of any other claims, and he went to Mr. Bailey for a price on the five acres. That was 14 years ago. Mr. Bailey asked $11,000, and the price was accepted, but Mr. Kimberly was a busy man and neglected to pay for the land. Mr. Bailey met him in the Grand Pacific in Chicago a year later. "I will send you a check at once, when I get home," said the mining magnate, and of course he intended to. A year passed and the two men met again. The conversation was much the same as before, and then another year passed and still Mr. Kimberly neglected to close for the five acres. More time elapsed and Virginia was growing. Mr. Bailey advanced the price to $20,000. Mr. Kimberly found no fault with that, but still neglected to close for the land, and then he died rather suddenly. The administrator was given an opportunity to buy at the same price. There was some more delay, for this was a big estate and involved a bewildering mass of transactions and detail. The last time Mr. Bailey gave an option to the administrator it was for $20,000, and to advance in price $1000 per month until the deal was closed. This was a verbal option, and it was 32 months before the estate finally exercised it, and Mr. Bailey received $60,000 for the property in the end. Allowance was made for interest on the long pending deal, which eventually turned out to the advantage of the lumberman.

Work of the Census Bureau

WASHINGTON CORRESPONDENCE.

The investigating committee lately named by Hon. William J. Harris, the director of the Census, and consisting of Hon. S. N. D. North and Hon. William B. Merriam, former directors; Prof. Walter F. Willcox, of Cornell University; Mr. W. S. Rossitor, formerly chief clerk of the Census, and Hon. Daniel C. Roper, first assistant postmaster general, and formerly an official of the Census Bureau, as special agents of the bureau to make studies of the present condition of statistical work, including particularly the unfinished work of the thirteenth census and plans for the better organization and administration of the bureau in connection with future annual and other inquiries, after several days' work occupied in inquiry and studies concerning the various problems assigned to them, has rendered a preliminary report which makes special recommendations as to mining.

It immediately became evident to these investigators that the problems before them in the bureau had best be treated in two separate divisions; first, and most pressing, the disposition of the much delayed work from the thirteenth census; and second, the plan for the future conduct of the bureau. The investigations thus far have been directed at the first division of the problem, namely, the overhanging work from the thirteenth census, and the following recommendations embodying the findings of these experts, have been submitted to the Director of the Census:

In pursuance of the instructions of the Director of the Census we have made a special study of certain branches of the statistical work in the bureau and in submitting the recommendations hereinafter enumerated we have had regard to the following conditions of facts:

(a) That the act authorizing the taking of the thirteenth and subsequent censuses requires that the reports of that census shall be completed and published on or before July 1, 1912; (b) that although three and one-half years have now elapsed since the enumeration, much of the thirteenth census work is still uncompleted; (c) that the regular annual reports and other work of the intercensal period have been greatly delayed because a large body of census clerks is still employed upon the delayed work of the thirteenth census; (d) that the value and usefulness of the annual and other reports required by law are largely dependent upon the promptness with which they are compiled and given to the public; and (e) that current appropriations are required for the purposes for which they are made.

We, therefore, advise the Director to begin no new tabulations or analyses in connection with the unfinished branches of the thirteenth census, namely, "Population" and "Mining and Quarries," and to readjust the work of those branches and on the delayed annual reports so as to insure their publication not later than Dec. 31, 1913.

To this end we submit the following recommendations:

(1) That the proposed second machine run of the cards for tabulating occupations be abandoned, thus expediting the time of production by about six months and reducing the cost of finishing that branch of the work by about $65,000; and that the tables yielded by the first run of cards be printed without derivative tables or text. These tables give the number of persons of each sex in each occupation, and classify them by race, nativity, and parent nativity, and five age periods, thus insuring the publication of the primary classification or occupational data as reported at previous censuses.

(2) That the report upon native tongue be limited to the chapter to appear in the forthcoming final volume on population.

(3) That the tables relating to "Mines and Quarries" now in the form of printed bulletins, proofs, or manuscript be sent to the Public Printer at once, the same to constitute the final report on mines and quarries, and that no further tabulations or text be prepared in connection with that report.

(4) That tables for the benevolent institutions, and for the institutional population, namely—prisoners, insane and feeble-minded, and paupers be prepared and published without percentage or other derivative tables and without analytical text.

(5) That the annual compilation of the statistics of forest products be abandoned. There appears to be no authority of law for an annual inquiry of this character, which the records show to have cost from $20,000 to $40,000 per year.

(6) That the annual report on the financial statistics of cities for 1912 be completed and published by Jan. 1, 1914, by curtailing the amount of detail to be included; that the schedules and report for 1913 be similarly curtailed; that the reports for the years 1912 and 1913 be printed without text, except such as is necessary for explanation and definition; and that until the annual reports on the financial statistics of cities are brought up to date, no attempt be made to prepare a report on general municipal statistics. This recommendation is based on the fact that delay in the compilation and publication of the annual municipal reports detracts seriously from their value.

(7) That the reports on mortality statistics for the years 1911 and 1912 be published before the close of the present calendar year. To make this possible, the text of these reports should be reduced to a minimum or omitted, the tables condensed, and no effort be made to publish a report on births until the mortality reports are published.

(8) That work upon the standardization of death rates, life tables, and occupational mortality be suspended until the above reports have been published. There is no reason why the mortality report for each year should not be compiled and published prior to the close of the succeeding calendar year.

(9) That in view of the emergency presented by the delay in completing the thirteenth census the Director request the Secretary of Commerce to lay the matter before the President with the view of securing his instructions to the Public Printer to give precedence so far as practicable to the remaining publications of the thirteenth census and the long overdue annual reports.

Having made these recommendations, the special agents will now severally give their attention to the various questions submitted to each of them by the Director of the Census, and prepare further memoranda for his consideration at an early date.

It is probable that the inquiries of these census experts into the most important but least pressing subject; the organization and administration of the Bureau in connection with the present and future work and the statistical reports to be taken up during the remainder of the present decade will be the subject of another series of recommendations, to be made to the director within the next 30 days.

DIRECTOR HARRIS TO FOLLOW EXPERTS' ADVICE

The businesslike and effective manner in which Director Harris has taken hold of the census problems inspires hope for extricating the Bureau from the deplorable condition in which the conduct of the thirteenth census work involved it. The group of experts which he has appointed to collaborate with him in working out present census problems and in outlining the future plans of the bureau are thoroughly conversant with census work as shown by their preliminary report. Their recommendations appear radical but it is evident that the conditions require radical treatment. Director Harris states that the recommendations of these special agents will be followed by him and the census reports given to the public without further unnecessary delay. He also expresses the hope and belief that the studies and recommendations of these former officials of the Bureau will result in a great improvement in quantity and quality of the census work, accelerate the reduction of expenditures, while at the same time preserving all valuable and useful data collected for the thirteenth census.

PERSONALS

Rush M. Hess has returned to Guayaquil, Ecuador, from Telluride, Colorado.

Charles Kirchhoff arrived in New York Sept. 8, after a sojourn in Europe of several months.

J. N. Curtis, of Tucson, recently examined properties near Kelvin, Arizona, in which he is interested.

A. L. Flagg, manager of the Kelvin-Sultana Copper Co. properties was in Douglas, Arizona, recently.

Bradley Stoughton, secretary of the American Institute of Mining Engineers, was in Denver, Colo., last week.

A. J. Proctor, who recently returned from Chile where he has been conducting drilling operations, is in Ray, Arizona.

J. P. Hutchins is visiting the copper and platinum regions of the Urals in Russia, on his return journey from Siberia to St. Petersburg.

Ed Hiatt, resident engineer of the Ray Consolidated Copper Co. has returned to Ray, Arizona, after a month's vacation spent in Chicago.

Francis P. Bray, who has been spending two months in Australia, is returning to London by way of Manila, China, Japan, and across Siberia.

E. Norris Hobart, engineer of the Mina Tiro General of the American Smelting & Refining Co., of Charcas, S. L. P., Mexico, will be in New York in the early part of October.

J. D. Galloway has been appointed acting assistant to the Provincial Mineralogist of British Columbia, and will do field work for the British Columbia Department of Mines.

Edward H. Benjamin has severed his active connection with the Joshua Hendy Iron Works, and will resume his former practice as consulting mining engineer in San Francisco.

Henry H. Armstead and Alex Smith Cochran from New York are in Guanajuato, Mexico, making an inspection of the Colmena Mining Corporation, and the Mexican United Co. properties.

J. D. McDonald has resigned his position as superintendent of the Ray Consolidated Copper Co.'s concentrator at Hayden, Arizona. He is succeeded by D. D. Moffat who comes from Utah.

Ernest B. Rose has been appointed secretary of the new safety department and labor bureau of the Republic Iron & Steel Co., at Youngstown, Ohio. A new office has been built at the plant to house these departments.

James Duane, Jr., superintendent of the Pittsburgh Crucible Steel Co., Midland, Penn., has resigned, to take effect October 1. He has made a remarkable record with one of the largest single-blast furnace plants in the country on basic iron.

C. B. Lakenan, general manager of the Nevada Consolidated Copper Co., has been visiting New York, but has now returned to Nevada to meet Messrs. Hayden, Jackling and others who are making a general tour of inspection of the properties in which they are interested.

N. Lilienberg, Betz Building, Philadelphia, Penn., has been appointed sales agent in the United States for the Stora Kopparberg's Bergslag Aktiebolag, Falun, Sweden, operating the Domnarfvet works, manufacturing electro steel under the Kjellin process. The company is the oldest organized mining company in the world.

Stanley C. Sears has resigned his position as general manager of the Utah-Apex Mining Co. at Bingham, Utah, to date from Oct. 1. Mr. Sears expects to be married on Oct. 8 to Mrs. Robert Holmes Officer, of Salt Lake City. He will have his office as mining engineer in the National Copper Bank Building, Salt Lake City.

At the Liberty Bell Mine, Telluride, Colo., W. H. Staver, resident superintendent, has resigned. C. A. Chase, consulting engineer of the company at Denver, has been promoted to the position of general manager in place of Arthur Winslow, of Boston, who vacates that position for Mr. Chase, but will remain president of the company as heretofore.

Captain Alfred Martin, who for some time past has been assistant general superintendent for M. A. Hanna & Co., with headquarters at Virginia, Mesabi range, has been transferred to the Menominee range, where he will be general superintendent of the Crystal Falls mines of the company. Captain Martin has had 38 years' experience in the Lake Superior iron country.

J. B. Clark, formerly assistant general superintendent of the Shoenberger works of the American Steel & Wire Company, Pittsburgh, has been made general superintendent of the Donora works of the company, succeeding E. Bayard, deceased. C. C. Hill, formerly assistant superintendent of the Shoenberger works, has been made general superintendent of that plant, succeeding Mr. Clark.

Ed. Dedolph, for some time engaged in the metallurgical laboratory at McGill University, Montreal, in connection with zinc ore reduction experiments, that have been conducted there under the direction of the Mines Branch of the Canada Department of Mines, is now in British Columbia, Dr. Haanel having arranged to continue the experiments at the electrothermic works, once operated experimentally by the Canada Zinc Co., at Nelson.

OBITUARY

William R. Davey, of Lake City, Colo., died at Portland, Ore., Sept. 11, from pneumonia, following an operation for appendicitis. He was 39 years of age and a graduate of the Colorado State School of Mines of the class of 1898. For several years he had been in the Federal government employ, at first in the Forest Service in Colorado, and for the past four years as a mineral inspector for the General Land Office, in the First Field Division, embracing Oregon, Washington and Idaho.

Dr. Hermann Credner, emeritus professor of geology and paleontology in the University of Leipzig, organizer and director of the Royal Saxon Geological Survey, died July 21, at the age of 72. He was a graduate of the Clausthal School of Mines, the University of Breslau, and took his degree of Ph.D. at Göttingen. In his younger years he was at one time connected with the mining-engineering firm of Adelberg & Raymond, New York, as an assistant. He was a splendid lecturer and of an amiable disposition. His death is much regretted by a large circle of friends.

Henry Barriohlet Kaeding, who died in Los Angeles, Calif., June 12, from heart trouble, was born in San Francisco in 1877. His early education was obtained in the public schools. His technical education was, with the exception of a year at the California School of Mechanical Arts, and a few months with Frank Green, then city chemist, obtained through personal study. After four years in the lode mines of Amador County, and a year in the placer mines of Plumas County, he made an extended trip, in 1896, to the South Pacific Islands in a small schooner, exploring the Galapagos, Guadaloupe and other islands, and making extensive collections of the flora and fauna for the Smithsonian Institution. He was an authority on Western ornithology. In 1898 he went to Korea for the newly organized Oriental Consolidated Mining Co., and was one of the first to treat concentrate by cyanidation successfully. He had charge of properties in Mexico and for two years was in charge of the Siempre Viva Mining Co. of Nicaragua. He was a frequent contributor to the scientific papers, and was a member of the American Institute of Mining Engineers, the California Academy of Sciences, the Cooper Ornithological club, and other scientific societies.

The death of James Ross, a noted financier and railway builder, and for many years president of the Dominion Coal Co., occurred at his home at Montreal, Sept. 20, from heart disease. He was born at Cromarty, Scotland, in 1848, and came to America in 1870. After filling some important engineering positions in the United States, he went to Canada, where he was engaged for many years in railway management and construction. In 1883 he took charge of the construction of the Canadian Pacific Railway west of Winnipeg, and was afterward engaged in completing the portion of the line east of Montreal. Mr. Ross took up his permanent residence in Montreal in 1888, and in addition to giving his attention to railway enterprises in the West and South America, associated himself with Sir William Mackenzie, in the building of numerous electric street railways. In 1901 he founded the Dominion Coal Co., the presidency of which he held until 1910, when he disposed of his controlling interest. He was prominently connected with many other financial and industrial corporations, and though during the last few years he retired from active business, he retained the presidency of the Dominion Bridge Co., and the St. John Street Railway until his death. Mr. Ross was an enthusiastic

yachtsman and took an active interest in many benevolent and educational institutions. He leaves a large fortune and is survived by one son, J. K. L. Ross.

Ray H. Webb, assistant general manager of the Southern Department of the American Smelting & Refining Co., in the city of Chihuahua, Mexico, died June 21, of appendicitis. Mr. Webb was born in Howell, Mich., Aug. 16, 1875. Afterward his family moved to Sioux City, Iowa, where his boyhood days were spent, and where he was educated in the public schools. He entered the Missouri School of Mines and Metallurgy, at Rolla, Mo., in 1898, but on account of ill health, only remained at the University two years. Leaving the School of Mines, he entered the employ of the old Consolidated Kansas City Smelting & Refining Co., at Argentine, Kan., but only remained there a short time, leaving to take a position at the acid works of the United Zinc & Chemical Co., also at Argentine. In January, 1904, Mr. Webb went to Aguascalientes, Mexico, as metallurgical chemist. Here his subsequent brilliant career was marked by a remarkable degree of energy and intelligence which received prompt rcognition by the management of the American Smelting & Refining Co. He was rapidly promoted to the position of chief chemist, then assistant superintendent, and finally, on on June 1, 1908, became superintendent of the Aguascalientes plant of the company. On Nov. 15, 1911, he was appointed assistant general manager of the Southern Department of the company, devoting himself principally to the metallurgical end of the business. Mr. Webb was married on Jan. 15, 1904, to Martha Murray Birkofey, of Tyler, Tex. The untimely end of so promising a young man is a great grief to all his numerous personal friends and business associates. He leaves a wife and two children, at present residing with his father, at Covina, California.

SOCIETIES

Copper Country Mining Club—It is announced that the first meeting for the season will take place at the Houghton Club, Houghton, Mich., the evening of Sept. 27. T. C. De Sollar, chief engineer of the Quincy, was to have read a paper at the October meeting, but this has been postponed till January, and H. E. Williams, chief construction engineer of the Calumet & Hecla, will be the feature of the October meeting. The program as newly arranged follows:

Sept. 27—"Proportioning Concrete," Prof. George L. Christenson, head of the mechanical engineering department of the Michigan College of Mines.

Oct. 18—"Draft Room Practice," H. E. Williams.

November meeting—Illustrated lecture on Panama canal, John T. Reeder, purchasing agent, the Tamarack-Osceola mines.

December meeting—"Electric Pumps," F. N. Bosson, chief electrical engineer, Calumet & Hecla.

January meeting—"Electric Haulage," T. C. De Sollar.

American Institute of Mining Engineers—The Colorado Section of the institute held a luncheon and business meeting at the Adams Hotel, Denver, on Sept. 16. Bradley Stoughton, secretary of the Institute, addressed the meeting and discussed favorably the desirability of local sections of the organization and pointed out the benefits to be derived therefrom. The first official election was held, resulting in the following officers for the ensuing year: William J. Cox, President; C. J. Moore, Vice-President; C. L. Colburn, Secretary. About 40 members of the Institute were present. Following the election, the meeting adjourned until November.

INDUSTRIAL NEWS

The first section of the Stephens-Adamson Mfg. Co.'s general catalog No. 19, covering power-transmission machinery, is issued in connection with No. 61 of its magazine, "The Labor Saver." A complete list of illustrations and tables is given of all lines of power-transmission devices. Bearings, hangers, pulleys, clutches, tighteners, etc., are covered. Manila rope transmission receives special attention.

The Electro-Steel Products Co., of which general offices is in the Miller Building, Scranton, Penn., has secured a tract of 25 acres near Connell Junction, within the city limits, and will erect a plant for the manufacture of high-grade steel and steel castings. A 3-ton Frick electric induction furnace will be installed. The electric current will be secured from the Lackawanna & Wyoming Valley R.R. Co. Charles H. Pond, of the Scranton Forge Co., is president of the new company; J. D. Jenkins, of Pittston, is vice-president, and J. H. Hungerford, of Scranton, is secretary and treasurer. The general manager is H. O. Bernhardt.

TRADE CATALOGS

Power & Mining Machinery Co., Cudahy, Wis. Bulletin No. 46. Cyaniding. Illustrated, 60 pp., 6x9 in.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y., Booklet "A Question of Drill Bits." Illustrated, 22 pp., 5½x3½ in.

The T. L. Smith Co., Milwaukee, Wis. Catalog No. 252. Rock-, ore- and gravel-handling machinery. Illustrated, 40 pp., 6x9 in.

Hendryx Cyanide Machinery Co., 107-109 William St., New York. Catalog No. 8. Cyanide machinery. Illustrated, 22 pp., 5½x8½ in.

The Brown Hoisting Machinery Co., Cleveland, Ohio. Catalog K. Brownhoist locomotive crane with grab bucket. Illustrated, 56 pp., 6x9 in.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 34 R. Enclosed self-oiling type compressors. Illustrated, 8 pp., 6x9 in. Catalog No. 43. Rockford railway motor cars. Illustrated, 28 pp., 6x9 in.

De Laval Steam Turbine Co., Trenton, N. J. Improved Methods of Using Small Turbines. Illustrated, 36 pp., 3½x6 in

This publication contains descriptions of connecting small turbines for driving auxiliaries in large steam-power plants, also in connection with exhaust-steam heating and drying systems in isolated plants.

NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ROCK-DRILLING ENGINE. John George Leyner, Denver, Colo., assignor to the J. Geo. Leyner Engineering Works Co., Littleton, Colo. (U. S. No. 13,614, reissue; Sept. 9, 1913.)

TUNNEL-DRIVING MACHINE. George F. Speer, Fort Worth, Tex., assignor to the International Tunnel Machine Co. (U. S. No. 1,072,050; Sept. 2, 1913.)

DEWATERING DEVICE or Means for Separating Solids and Liquids. Wilbur Alson Hendryx, New York, N. Y. (U. S. No. 1,071,917; Sept. 2, 1913.)

FLOTATION PROCESS—Ore Concentrator. Henry Ellsworth Wood, Denver, Colo. (U. S. No. 1,071,850; Sept. 2, 1913.)

MAGNETIC SEPARATOR. Georg Ullrich, Magdeburg, Germany. (U. S. No. 1,072,276; Sept. 2, 1913.)

SLIMES FILTER. Ulysses A. Garred, Anaconda, Mont. (U. S. No. 1,072,111; Sept. 2, 1913.)

VALVE for Controlling the Flow of Thick Pulpy Material and the Like. Edward Hoit Nutter, New York, N. Y., assignor to Minerals Separation Ltd, London, England. (U. S. No. 1,071,784; Sept. 2, 1913.)

GAS PRODUCER. Emile Dor-Delattree, Liege, Belgium. (U. S. No. 1,072,098; Sept. 2, 1913.)

ROASTING—Automatic Charging Device for Roasting Furnaces and the Like. Ludwig Singer, Bochum, Germany. (U. S. No. 1,071,962; Sept. 2, 1913.)

ROASTING—Improvements in and Relating to Mechanical Roasting Furnaces. Helsingborg Kopparverks Akt., Helsingborg, Sweden. (Brit. No. 29,235 of 1912.)

DRY-ORE SEPARATOR. William W. Bonson, Dubuque, Iowa, assignor to Bonson Dry Concentrator Co., Dubuque, Iowa. (U. S. No. 1,073,069; Sept. 9, 1913.)

ORE TREATMENT—Improvements in the Treatment of Refractory Gold and Silver Ores. C. Butters, London, Eng. (Brit. No. 18,660 of 1912.)

PLACER MINING—Improvements in Means for Separating Minerals from Alluvial Wash. R. Hughes, Wilson's Downfall, N. S. W. (Brit. No. 20,190 of 1912.)

FINE ORES—Utilizing Fine Ores, Flue-Dust and the Like. Hartley C. Wolle and Edward F. Kenney, Westmont Borough, Penn. (U. S. No. 1,073,381; Sept. 16, 1913.)

LADLES—Nozzle for Ladles. Charles E. Michaels, Wilson, Penn. (U. S. No. 1,072,972; Sept. 9, 1913.)

LEAD AND ZINC—Process for the Separation of Lead and Zinc. Jules Babé, Honfleur, France. (U. S. No. 1,073,461; Sept. 16, 1913.)

ZINC—Improvements in or relating to Apparatus for the Continuous Removal of the Residues from the Reduction of Zinc Ores in Vertical Retorts. A. Roitzheim, Cologne, and W. Remy, Aachen, Germany. (Brit. No. 732 of 1913.)

DRILLING—An Improved Rock-Drill Chuck. M. T. Taylor, Cornwall, Eng., and J. F. Gardner, Mt. Chambers, Queensland. (Brit. No. 8560 of 1913.)

DRILLING—Improvements in Percussive Rock-Drilling Tools. G. A. Chalkley, Germiston, Transvaal. (Brit. No. 18,443 of 1912.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Sept. 17

Expert Examination of Angels Camp Mines, by M. B. Huston, of Los Angeles, and J. E. Spurr, of Philadelphia is reported to have been made in the interests of Tonopah operators. The properties included in the examination are the Angels, the Lightner, the Sultana, the Maltman and the Baumhogger, which may be operated as one property.

The Forest Fire Record in California for the first half of 1913, as reported by the U. S. Forest Service, shows a remarkably small acreage burned over and few fires, compared to former years. The total area burned over was 18,929 acres, entailing a total damage of $2620. There are 19 national forests in California and up to August 16, the total fires in these forests amounted to 609. The records show that 88% of the fires were extinguished before they had burned over 10 acres each. The average per fire was 31 acres.

The Closing Down of the Zeila at Jackson, Amador County, is expected at the end of the year; whether temporarily or permanently will probably depend solely upon whether or not the mine can be sold to men who have a disposition as well as the means to continue mining for the development and establishment of the property on a deep mining basis. Stock of the Zeila Mining Co. is held by a close corporation and none of it has ever been sold or offered for sale to others than the initial holders of the shares or their heirs or estates. The total production during its 34 years of operation is estimated to have been $10,000,000. The Zeila company is probably about the closest "close" corporation in the state. No information of any importance has ever been given out by the management. The superintendent has for years declared that the mine was worthless, but within the last two years he has been willing to have it examined by engineers for prospective buyers. On the 1500-ft. level, an oreshoot was disclosed in a winze this year. In order to develop this ore it will be necessary to install a new hoist and sink a 1500-ft. shaft, and the present owners are not disposed to enter upon this essential improvement of the property. The stockholders are mostly men past middle age and apparently have become satisfied with the results of the operation of the Zeila mine up to the present time, and like other old time California miners they are likely to abandon the mine entirely unless the energy and capital of more progressive men take hold of the property. The Zeila is on the East belt of the Mother Lode region or close to and adjoining the Central belt or Mother Lode proper, but this situation is not considered by mining engineers of large experience on the Mother Lode to be against the probability of the development of a deep mine at this point.

DENVER—Sept. 20

The Newlin Gulch Gold Placers near the head of Cherry Creek, 32 miles southwest of Denver are arousing more than ordinary interest. A camp of 15 tents is established there, and visitors from Denver are going out daily. It is stated on good authority that F. B. Hughes is cleaning up from $15 to $20 per day with his line of sluices, and McIntyre took out $47 worth of gold in one day in a run of five hours. He used a wheelbarrow to deliver the dirt to his sluices. Sixteen men are busy planning or sluicing, and the gold appears to be widely and evenly distributed.

The Convention of Southern Colorado Coal Miners, held at Trinidad, Aug. 22, passed a resolution to the effect that, in view of the failure of their efforts to secure a peaceful solution of their differences with the operators and the fact that the operators have declined to meet or confer with them, a strike call be issued to all mine workers in Colorado, to take effect Sept. 23. About 9000 men are employed in the mines where the trouble is expected and 60 mines will be tied up. The demands of the miners are as follows: Recognition of the union; 10% advance in wages on tonnage rates, and a daily wage scale on the same basis as that of the State of Wyoming; 10% advance on the wages paid coke-oven workers; an 8-hr. day for all classes of labor in the coal mines and coke ovens; pay for all narrow work and dead work which includes, timbering, removing falls, handling slate, etc.; check weighmen at all mines to be elected by the miners without any interference by company officials; right to trade in any store, and the right to choose their own boarding place and their own physicians; enforcement of the Colorado mining laws; abolition of the guard system which has prevailed in the mining camps of Colorado for many years. Secretary of Labor Wilson has designated Ethelbert Stewart, chief clerk of Federal Bureau of Labor, as mediator. Stewart has started for Denver and Secretary Wilson believes that a strike may be averted through his efforts. President Welborn, of the Colorado Fuel & Iron Co., declares that under no circumstances will that company's officials meet representatives of union miners. He said: "If a strike is called it will be to the finish. What practical effect will be no one can forecast accurately. It is my conviction that far less than 10% will leave their places because of loyalty to their union." Officials of the Victor American Fuel Co. and the Rocky Mountain Fuel Co. have voted to hold out against demands of the miners. [From 80 to 90% of the miners went out on strike Sept. 23; the countries affected being Fremont, Huerfano, Las Animas, El Paso, Boulder and Routt. The Minnequa plant of the Colorado Fuel & Iron Co., it is expected, will have to close down within 24 hr. for lack of fuel, after 10 years of continuous operations.]

BUTTE—Sept. 18

The Butte Miners Union has already sent $21,000 to the Michigan strikers and has assessed every member of the union one day's pay in October, by which means it is expected $28,000 will be raised. In addition to all this the miners have been collecting provisions by the carload, and subscriptions. Other Butte unions have contributed several thousand dollars to the strikers and have promised more.

Butte, Wisdom & Pacific R.R. surveyors are making good progress and report encountering less difficulty than had been anticipated. The road is to be built by the Boston & Montana Development Co., at the head of which is W. R. Allen, former lieutenant-governor. The company has also taken over mining properties in the French Gulch and Elkhorn districts, which it is thought can be profitably exploited when transportation is afforded.

The Butte & Duluth is making good in the eastern section of the Butte district, although copper has not been produced quite so cheaply as some people have been claiming. It has cost Captain Wolvin about 13c. per pound to recover copper by his leaching method, and in August the cost was 12⅞c. per pound. However, the mill has capacity at present only for 100 tons per day and Captain Wolvin says that by increasing the capacity of the mill and tanks to 500 tons per day, he believes he can cut his present cost of copper one-half. He has so well demonstrated the value of the copper deposits on the east side that other interests, representing Thomas F. Cole and others, have bought up practically all of the mineral ground in that part of the district.

SALT LAKE CITY—Sept. 18

Dividends From Park City Mines paid since the first of the year total $504,500. The Daly West has distributed $27,000; the Daly-Judge, $135,000; the Silver King Coalition, $187,500; the Silver King Consolidated, $155,000. Including the Ontario, Daly, Quincy, and other old-time producers, the camp has a record of over $100,000,000 gross production, of which $40,000,000 has been distributed in dividends.

The Strawberry Tunnel Was Completed Sept. 13 by the opening of the gates of the east portal. The tunnel was built by the U. S. Reclamation Service under the direction of J. L. Lytel, project engineer, to irrigate 60,000 acres of land in Utah Valley. The tunnel is four miles long, and brings the waters of the Strawberry River and Indian Creek on the Pacific drainage slope through the Wasatch range into the Great Basin, which has no outlet. The idea was conceived in 1902, and taken up by the Reclamation Service in 1904. Work on the tunnel was started in 1906. Beside the tunnel upward of 40 miles of diversion and lateral canals have been dug. There is a dam across the Strawberry River 71 ft. high, earth filled, with concrete walls. The Indian Creek dike, is 37 ft. high, 1400 ft. long, and of the same construction and material as the dam proper. The reservoir covers an area of 8200 acres, and has a capacity of 275,000 acre-feet.

CALUMET—Sept. 20

Federal Investigators have been in the Copper Country for some time; they have investigated strike conditions and have prepared an exhaustive report which will be submitted to the Department of Labor. The latest move toward bringing about a settlement of the labor situation has been undertaken by the Copper Country Commercial Club, which comprises about 500 business men of Houghton and Keweenaw Counties. A committee of three members has been appointed and has been securing data, as to wages, hours worked, etc., and has made several trips underground to study actual working conditions. A temporary office has been established and information will be compiled from all available sources and a complete report of the investigation will be published. Governor Ferris is considering calling a special session of the Legislature and is taking the subject up with the individual members of the Assembly and Senate, but a special session is not considered likely. The strikers held several early morning parades in Calumet, augmented by the strikers and sympathizers from the North End district; most of these demonstrations were orderly and little disturbance was made throughout the strike zone until yesterday, Friday, when there were battles between strikers and loyal workmen at Calumet, Laurium, Hancock, Wolverine, Isle Royale and Champion. A militiaman at Isle Royale was shot through the arm and 20 arrests were made during the day. At the Quincy, a bunkhouse and cook shanty have been fitted up at the mine and outside men will be brought in to resume operations. The first lot of men, numbering about 33, have arrived and others will follow. The Calumet & Hecla is adding continually to its underground force and rock shipments to the mill are now running about 4000 tons daily. Several men from the subsidiary properties have applied for work and are being taken care of at the Calumet & Hecla. A small force of men is working in No. 5 and No. 6 shafts of the Osceola, but shipments to the mill have not yet been started. The Copper Range continues operating on a limited scale. The management served notice on the men some time ago to either return to work or vacate the company houses, but a restraining order was granted by the Houghton County circuit court. In the arguments and agitation put forth by the Federation and others regarding the wages paid by the mines of this district in comparison to the other copper mines, a significant fact seems to have been overlooked and that is that the mines of the district have operated at practically full force throughout periods of depression in the metal market and some of the properties have actually operated at a loss, having the welfare of their employees at heart they did not suspend operations. Hard times have heretofore been unknown in the copper country.

HOUGHTON—Sept. 22

An Injunction Against Picketing has been issued against the striking copper miners. In fact the use of injunctions is becoming a feature of unusual interest in the copper-country strike. "Government by injunction" has been anathematized by labor agitators for many years, yet the lawyers of the Western Federation of Labor were the first to utilize here this legal procedure to accomplish their own ends. Early in the history of the strike the labor leaders applied to Judge Patrick H. O'Brien for an injunction to prevent the sheriff from hiring Waddell-Mahon men to assist him in the preservation of peace and order and to prevent the county from paying the bills for the employment of these men. That case is still pending in court. Two weeks ago, when the Copper Range Consolidated ordered strikers to go to work or move out of the company houses, the labor leaders applied to Judge O'Brien and secured an injunction preventing ejectment. The application of this injunction keeps these strikers in company houses, notwithstanding the fact that they have paid no rent for two months and do not expect to pay. They cannot be ejected without a 30-day notice, which notice now has been served. Up to this point the utilization of the injunction has been entirely in the hands of the strikers themselves and they made the most of every opportunity. The injunction against picketing was issued by Judge O'Brien this week and this move by the mining companies comes like a touch of sardonic humor to the situation. The injunction is sweeping in its scope; it includes practically every labor agitator stationed here. One immediate effect of this injunction relates to the petty disturbances and frequent "beatings up" of workers by Federation strikers. The courts are crowded with these cases. Strike leaders assault men going to work. They are arrested, brought before a justice of the peace, released on bonds of, say, $200, and the next morning they again beat up some workmen. Their cases are all set ahead for trial and it is doubtful if they will ever be found guilty. The application of the injunction principle places the burden of proof of innocence on the striker. Now when he beats up a workingman he is in contempt of court and must prove that he was not violating the provisions of the injunction. Answering the proposition of John H. Moffitt, representative of the Department of Labor, for arbitration of the strike, the mine managers have again declared that they will have no dealings whatsoever with any of the members of the Western Federation of Miners, or with any representatives of such men. The answer declares more emphatically than the statement previously made that the Federation will not be permitted to control any of the employees.

GRAND FORKS, N. D.—Sept. 18

Cheap Mining of Lignite has been demonstrated by the Government in mining this material for the Williston reclamation project. The coal has been produced at a cost below that of private mine owners, and better wages are paid to miners. The coal miners are skilled in their work, and receive from $4 to $5 per day, working on the tonnage basis. They are provided with shower baths, private lockers, bunk rooms for single men and a restaurant where the miners can secure meals at 25c. each. As against an average cost in private mines of about $1.50 per ton, the Government is mining its coal at about $1.30, and the engineer in charge of the project, anticipates that ultimately the cost of mining will be reduced to $1. Delivered at the project station, coal mined by private owners would cost the government about $2.50 per ton.

JEROME—Sept. 12

Construction Work on the Clarkdale Smelter is progressing rapidly, and work is being done on three shifts, shaft sinking and tunnel driving at the mines. Much heavy machinery is being hauled in to several of the properties, most of which will compare favorably with the best mining equipment in the state. New roads are being built to certain of the mines so they can be reached easily and on a good grade with auto trucks. Branch lines are being laid to other mines in order that ore and supplies may be hauled to and from the new Santa Fé railroad which was recently completed into the Verde Valley four miles below the town of Jerome. Work on the new custom smelter is well underway. Heavy machinery is arriving daily over the new railroad and is being placed as rapidly as possible. Brick cottages in the new town of Clarkdale about one-half mile from the smelter are now being built for the accommodation of the workmen. There are about 2000 men employed in the camp of Jerome and immediately surrounding it and at the new smelter at Clarkdale. On the United Verde Copper Co.'s narrow-gage railway, which connects with the Santa Fé at Jerome Junction, a new depot has been built at Jerome just north of the crushers. At the Cleopatra mine, which was recently bonded and leased to a Scotch syndicate by George W. Hull for a consideration said to be $300,000, a tunnel is being driven under what was locally known as the opencut, on top of and in the saddle of the mountain just in front of Jerome, locally called Smelter Mountain. The present smelter of the United Verde company is on this side of the same mountain. Some of the ore recently cut contains much native copper which shows up about the size of pin heads. The vein has maintained its course now for about 75 ft. with prospects of it going on through the mountain where there is a large outcrop which evidently is a part of the vein. Arrangements are being made to sink a shaft on this ore from the saddle near the opencut. A road is to be constructed up to this point so supplies can be hauled in. A hoist will then be installed.

TORONTO—Sept. 22

Production in Northern Ontario from silver, cobalt, nickel and gold mines has just been received by the Government, the report being the first officially made since 1908. Dr. W. G. Miller, provincial geologist, who compiled the report, states that Cobalt besides being one of the world's greatest silver areas, controls the market for cobalt and has the largest output of arsenic and is also among the three or four areas that have the largest output of nickel. As a general rule, however, most of the nickel is lost in the smelting process. Statistics show that up to the end of 1912 Cobalt has produced 155,815,839 oz. of silver valued at $81,731,115. The quantity of cobalt, nickel and arsenic produced is not known. Up to the end of the year, the total dividends from Cobalt mines amounted to $39,834,740, which does not include the profits made by two or three privately owned properties. Adding the dividends which have been paid since the close of 1912, the total distribution is estimated at $45,000,000, which is approximately 50% of the value of the output. It is interesting to note that the discovery of the Cobalt district was due to the building of the Timiskaming & Northern Ontario Ry. and that while the mines have paid in dividends about $45,000,000, the railroad cost only $18,500,000.

THE MINING NEWS

ALASKA

McCANDLISH & SULLIVAN (Meehan)—Reports from Fairbanks Creek are that rich pay has been discovered on Claim No. 20 Below. Heretofore, practically no pay has been found on this creek farther down than No. 12 Below.

MacGILLIVRAY-ELLIS LEASE (Dome City)—A one-third interest in the MacGillivray-Treml lease on the Wild Rose claim has been purchased by H. I. Ellis. Ore for a test shipment to the Spalding mill will be mined as soon as possible.

FALLON MITCHELL & CO. (Fairbanks)—A laborer was killed July 28, by a cave-in; he, with two other laborers, was working in a timbered crosscut, when, without warning, the timbers were crushed by the overlying thawed gravel. The other men escaped uninjured.

NEWSBOY (Cleary)—July operations were carried on under difficulty, as all water for the boiler at the mine had to be hauled from Cleary Creek up a heavy grade. Sufficient water has been available since the heavy rains of early August to put the mill on a 24-hr. shift.

L. L. JAMES (Fairbanks)—L. L. James has secured a bond on 14 association placer claims, a total of 2240 acres, on Chena Slough a short distance below the town of Fairbanks. The price asked is $500,000 and the first payment, $28,000, is due Feb. 4, 1914. The balance is to be paid out of royalty. By the terms of the agreement, a dredge must be on the ground by Aug. 4, 1914.

HARDING & CO. (Dome City)—These lessees on No. 6 Below, third tier, right limit of Dome Creek, commonly known as the old Robinson ground, have discovered pay running from 3 to 20c. per pan. Bedrock was reached at a depth of 205 ft. Tunnels are now being driven to determine the width and continuity of the supposed paystreak, but no sluicing will be done until next season.

SPALDING & BRUMBAUGH (Dome City)—A contract has been let to drive the east drift on the 100-ft. level another 100 ft. It is planned to drive an adit to connect with the shaft on the MacGillivray-Ellis lease at a depth of about 250 ft. The adit will drain the workings, and will at the same time furnish water for the larger mill that is planned. It will also develop the 4-ft. Soo vein, the ore of which is too low-grade to be worked profitably with present equipment.

ARIZONA

Cochise County

CALUMET & ARIZONA (Warren)—Pending the actual closing of the options on the new steam-shovel property in the Ajo Mountains little information as to developments has been obtainable. It is stated, however, that the churn-drills have already placed in sight a steam-shovel tonnage of 27,000,000 and that the ore averages 1.7% copper.

Maricopa County

RELIEF (Glendale)—The cyanide plant is in operation. Development work is under way. At a later date the mill is to be placed in operation.

RED ROVER (Phœnix)—It is rumored that Phelps, Dodge & Co. have taken an option on this mine. Sinking in the shaft has been discontinued until larger pumps can be installed. Many tons of low-grade ore are on the dump.

Mohave County

GOLD REED—An electric hoist, pump and compressor are being installed at the Jupiter shaft, which is 235 ft. deep.

YELLOW JACKET—This property has been closed, development work requiring a greater expenditure than the operators were prepared to make.

GOLD ROAD (Gold Road)—Filter leaves have been discarded, due to the belief that a greater saving can be effected by a system of decantation, which is being tried out. The old filter tank is being used for a supplementary settling tank.

NEVADA-ARIZONA MINES CO. (Hackberry)—The mill is practically ready for operation. Some excellent ore has been found in the shaft below the 200-ft. level, and it is expected that sufficient water will be developed for milling purposes.

CONE MINING & MILLING CO. (Oatman)—This company, of Fresno, Calif., men, has taken a bond on property near Oatman. A road is being built from the Oatman-Needles road to facilitate delivery of mining supplies. There is a shaft, 90 ft. deep, and some good ore has been found.

WALKOVER—This property, near the Copper Giant, is being equipped with a hoist and pump. As soon as they are installed, sinking the main shaft will be continued. This property has been operated before and there is shipping ore on the dump, which will be sent to the United Verde smelter.

TOM REED (Oatman)—Two rich strikes have recently been reported on this property. One was made on the Ollie Oatman claim, north of the main shaft and the other on the Black Eagle, to the south of the present working shaft. The shaft on the Ollie Oatman claim has reached a depth of 400 ft. and a drift is being driven to intersect it from the main shaft of the Tom Reed property. Some of the ore discovered is said to be full of coarse gold, the average of the oreshoot, so far as sampled, being much higher than the average ore now being milled. In the Black Eagle claim, the oreshoot is 12 ft. wide. A hoist is being installed at the shaft on this claim, which is over one-half mile from the main shaft.

Pinal County

RAY-ARIZONA (Ray)—Drilling operations are proceeding satisfactorily, the first hole having attained a depth of 220 ft. Little development work is being done.

KELVIN-SULTANA (Kelvin)—A winze has been started on the No. 2 vein from the 300-ft. level. At this point there is a streak of chalcopyrite 4 ft. wide. A tramway for carrying ore across the Gila River has been ordered from A. Leschen & Sons of St. Louis. Work has been resumed in the old Agnes shaft which is producing 3 tons of carbonate ores daily.

Santa Cruz County

PROGRESSIVE (Ruby)—A recent flood in California Gulch destroyed the pumping plant and some of the houses, but the laboratory and the mill were not seriously damaged.

ORO (Old Glory)—Development work which has been going on for the last two years is about completed. The main shaft is 350 ft. deep, the deepest in the Oro Blanco district. The vein is 16 ft. wide at the bottom of the shaft with a 5-ft. pay streak. The ore is siliceous, carrying sulphides of iron, copper and lead, in which the gold occurs. G. B. Williams, of Rochester, N. Y., the owner, is now conferring with his associates about future developments.

AUSTERLITZ (Oro Blanco)—After nearly a year of idleness because of litigation, operations are to be resumed. The property has had a checkered career, the latest operations being the most disastrous. Immediately following a recorded production of $90,000 of shipping and milling ore, the mine was closed under numerous attachments. A. H. Noon, of Nogales, the original owner finally obtained control of his property, and has given a bond to William J. Partridge and others who have started operations; there is a 20-ton concentrator at the mine, and it is thought that with careful management it will be a successful producer.

CALIFORNIA

Amador County

HARDENBERG (Jackson)—The recent cutting down on the number of men employed was temporary, and has since been increased.

WEST EUREKA MINING CO. (Sutter Creek)—A purchase bond has been secured on the Alpha, or Last Chance, west of the Central, or old Eureka, owned by Hetty Green, of New York. It is reported the property will be equipped for development.

Butte County

SUCCESS (Oroville)—This gravel mine was flooded by the miners breaking into an abandoned tunnel. Two men were carried by the water through the drift tunnel they were working in and lodged against a ladder by which they escaped to an upper level.

Calaveras County

LIGHTNER (Angels Camp)—Twenty stamps are dropping, and it is expected to start a second unit of 20 stamps soon.

ORO ELECTRIC CORPORATION (Oroville)—Rights-of-way in the Jenny Lind mining district have been acquired.

ECONOMIC (Esmeralda)—A portion of the new electric power line was destroyed by forest fire, Aug. 25. The line has since been fully repaired. Another forest fire put the telephone-line connection out of commission.

AMALGAMATED EXPLORATION CORPORATION (Esmeralda)—The installation of the electric power line is practically completed for the operation of the mine and mill. The lighting plant installation is completed and the mining property and the town are lighted.

Inyo County

TRAMWAY is the new designation for the old mining camp of Swansea, adopted by the Saline Valley Salt Co.

TUNGSTEN ORE has been discovered in the foothills west of Bishop; both wolframite and scheelite are reported to have been found.

YELLOW MONSTER (Laws)—A 3-roll Huntington mill will be installed. The water for milling will be pumped from Coldwater Cañon.

Kern County

KING SOLOMON (Randsburg)—The mill was closed down temporarily in August, to repair a concentrator.

GOOD HOPE (Randsburg)—Ten tons of scheelite treated at the Atolia mill, gave a net return of $80 per ton. The ore was mined near the surface by Harry and George Swarthout lessees.

Nevada County

GOLDEN CENTER (Grass Valley)—It is reported that a 10-stamp mill will be built.

DELHI (Columbia Hill)—The pumps have been started after being idle more than two years. It will require about six weeks to unwater the mine. The shaft is 500 ft. deep. This shaft was sunk just prior to the suspension of work to await the completion of the 5-mile flume and ditch. This flume and ditch is now entirely completed. It is expected to put the 20-stamp mill in commission this autumn. The flume is running about 1000 in. of water. One-half this amount will be required.

Orange County

A GYPSUM DEPOSIT, near Corona, is said to have been developed by Amestoy Bros., of Los Angeles. The initial shipment was recently made.

Placer County

PACIFIC GOLD DREDGING CO (Auburn)—The dredge under construction at Butcher ranch, on the middle fork of the American River, it is expected will be completed by Oct. 1.

Santa Clara County

MORENO VS. NEW GUADALUPE (Guadalupe) — Jessie Moreno has brought suit to recover $33,500 for the death of her husband Frederick Moreno on Aug. 16, 1913. The complaint alleges that Moreno was thrown from a skip to the bottom of the shaft by the careless operation of the hoist.

Shasta County

GLADSTONE (French Gulch)—While the new hoisting plant is being installed it has been decided to retimber the shaft for a depth of 150 feet.

COLORADO

Clear Creek County

GOLDEN GLORY—A contract has been awarded to J. D. Burns to advance this tunnel an additional 100 ft. into Saxon Mountain. The tunnel is now 1400 ft. long.

LITTLE DORRIT—It is reported that recent operations of the new mill are gratifying, but that the management is considering the advisability of adding cyanide equipment.

IDAHO BRIDE—This mine on Seaton Mountain is shipping regularly to the local mills. Two carloads went out last week to the Newton and Combination mills and E. D. Payne, manager, says the output will be increased to two carloads per day.

FRENCH FLAG—Following a recent examination of this property in Gilson Gulch, it is reported that 11,000 tons of $10 ore is available above the 135-ft. level. The property has been equipped for operation and will probably resume production this month.

SIDNEY TUNNEL—Development is to be resumed at this property in the East Argentine district. The tunnel is now 2125 ft. long, and is being cleaned out and repaired preparatory to advancing it. It is estimated that the White vein will be intersected within 150 ft. The Ontario vein, which was cut 2000 ft. from the portal of the crosscut, will be explored by a drift.

Teller County

LUCKY CORNER (Cripple Creek)—Seventy-one tons of smelting ore of high grade was recently shipped from this mine of the Doctor-Jack Pot company.

GOLD DOLLAR (Cripple Creek)—A shoot of rich calaverite ore has been opened. It was found in the 13th level from the Mable M. shaft and has already been exposed for 65 ft. in length. This rich streak is said to be 12 in. wide, accompanied by 5 ft. of milling ore.

EL PASO (Cripple Creek)—Robert A. C. Peterson, a mining promoter has begun suit against the company charging that he has been frozen out of 10% of property and profits due him because of his activity in forming mining properties into a corporation to control paving mining properties. He also began action against the Colorado Mines, Railways & Utilities Corporation for $600,000, which he declared to be due him for negotiating the purchase of the Golden Cycle mine, which is estimated to be worth $6,000,000.

IDAHO

Cœur d'Alene District

INTERSTATE-CALLAHAN (Wallace)—A 6-ton Jeffrey locomotive has been delivered for use in the main tunnel.

TAMARACK (Murray)—An 8-ton transformer is being installed at this mine by the Washington Water Power Co.

MOON CREEK—A contract has been let to drive 75 ft. When completed the crosscut will be in 300 ft. and within a short distance of the vein.

ST. LAWRENCE (Saltese)—A carload of high-grade copper ore has been shipped from this property. This is the first ore shipped from the mine.

SHERMAN—The drift will be continued to gain greater depth on the vein and to get to a point under the best surface showing. Good milling ore has been developed in the drift.

YANKEE BOY—A new vein was struck at this property on Big Creek by the leasing company which is driving a new tunnel. The strike was entirely unexpected. The ore at this mine is rich in silver.

CARBONATE (Mullan)—Samples from the vein which was recently struck show the ore to contain lead, silver and copper. The showing is encouraging to the owners and development work will be done throughout the winter.

ANTIMONY—This property on Pine Creek will be operated under lease. A large amount of ore was shipped from the property years ago. The mine was shut down when the workings under the creek were flooded. The orebody is about 300 ft. long and from 2 to 4 ft. wide. Only first-class ore will be shipped at present as the old mill is unfit for use. If developments warrant it a new mill will be built.

NABOB (Kellog)—At a recent meeting of the directors it was voted to take over the Idaho and "V" group of claims, which adjoin the Nabob property and lie between it and the Federal mines. These claims are taken over on bond and represent an approximate value of $140,000. The development of the Nabob properties has led directly to the lease of the "V" and Idaho claims. The oreshoot on the Nabob heads straight into the leased claims and the future of Nabob seems to point to the necessity of consolidation of the properties thus giving the Nabob control of everything lying between its holdings and the Federal groups.

MICHIGAN

Iron

COAL MINES NEAR BAY CITY were closed down Sept. 17 and will not resume operations until the labor troubles between the Handy Brothers' Mining Co. and their men are adjusted; about 3000 men are affected. Thomas W. Davis, commissioner for the operators of Michigan, in a statement said the trouble was due to the alleged refusal of the union offirials to consent to arbitration of differences with Handy Bros. when 700 men recently struck, claiming that the operators had refused to pay what was due them under the working agreement made in April, 1912.

RICHMOND (Palmer)—This property in the Cascade district, will send out about 140,000 tons this year. The mine is the only open pit now in operation on the Marquette range; the ore is hard and difficult to mine.

VOLUNTEER ORE CO. (Palmer)—Three drills have been started to test the formation in order to find a suitable place for a new shaft. When this drilling is finished the drills will be moved to the big swamp near Palmer Lake, where it is believed that ore exists.

BREITUNG (Negaunee)—It has been announced that a total of 600,000 tons of iron ore will be shipped by these mines this season. The Mary Charlotte will ship 400,000 tons; the Breitung Hematite 100,000 tons, and the Barron 100,000 tons. The mines are not working with as large forces as at this time last summer but there was considerable ore in stock when navigation opened and most of the piles will be cleaned up before winter sets in.

MINNESOTA

Cuyuna Range

KENNEDY (Crosby)—The stockpile of over 90,000 tons has now been cleaned up. Total shipments for August were 24,000 tons and for the season to Sept. 1 over 100,000, not including stockpile shipments.

CUYUNA-MILLE LACS (Crosby)—Regular shipments are now being made, a train of ore going to the docks every day. The first ore left the docks only a few weeks ago and was the occasion of quite a celebration.

BARROWS (Crosby)—Ore is now being hoisted and it is believed that it will not be long before shipments will be made. Several thousand tons will probably find their way to the lower lake ports before the closing of navigation.

JAMISON & PEACOCK (Crosby)—The "40" now being drilled by the Cuyuna Realty Co., is showing up much good ore. One hole recently averaged 66.6% iron and approximately 0.01 phosphorus for a distance of 80 ft., which is the best ore yet encountered on the Cuyuna range.

IRON MOUNTAIN (Brainerd)—The three-compartment shaft on this property has been sunk to a depth of over 75 ft. and the orebody is near at hand. About 30 men are working but the force will be increased as soon as drifting is commenced. The ore in the Iron Mountain is high in manganese and there is a considerable quantity of it. It is predicted that the property will ship this year but this is doubtful.

CUYUNA IRON & MANGANESE CO. (Crosby)—This company has quite an acreage near the Pennington pit, where several drills are at work. A good body of manganese ore has been located at a depth of 50 ft. from surface. Continued drilling showed the ore to go as deep as 425 ft., and the management believes that it will have a large pit mine in the near future. Another drill will be added soon, so that the exploration work can be carried on more rapidly.

Mesabi Range

EATON (Buhl)—This property, on which development was begun early in the season, is expected to ship 10,000 to 15,000 tons before navigation closes. The product is bessemer ore.

MISSABE DOCK (Duluth)—The entire concrete foundation for the new Duluth, Missabe & Northern Ry. Co.'s dock at Duluth will be completed before Nov. 1. The dock will be ready for the opening of the 1914 season; total cost estimated to be $2,900,000.

PENNINGTON (Crosby)—This company is now making regular shipments, one shovel being employed all the time loading ore, while the other is stripping. The ore now being loaded is exceedingly hard and blasting has to be resorted to frequently.

DULUTH-BRAINERD MINING CO. (Brainerd)—Sinking of a shaft has been started on the lands of this company, where manganiferous ore was discovered a short time ago. Several sets of timbers have been put in place, and it is figured that it will not take long to sink to the ore. Several mine buildings are being built and the boilers have already arrived.

Vermilion Range

CONSOLIDATED VERMILION & EXTENSION CO. (Tower)—Ore is now being hoisted from both shafts and developments underground have been highly satisfactory. A substantial tonnage has been blocked out in No. 1 and the shaft will be sunk another 100 ft., which will provide for two more levels. The No. 2 shaft is mainly an exploratory shaft but is bottomed in commercial grade ore which is being taken to surface for shipment.

VERMILION & MESABI IRON CO. (Tower)—The main drift east from the shaft was in ore for a distance of 15 ft. when work was stopped to drive a crosscut to the south. The shaft is vertical for a depth of 170 ft., and from that point to a depth of 210 ft., the bottom is an incline. The crosscut to the south will be swung around to a point under the vertical section of the shaft and behind the incline. A raise will be made to connect with the 170 level, which will enable hoisting to be carried on to better advantage. The shaft will be sunk another 100 ft. in the near future. The south crosscut has already cut 20 ft. of ore.

Koochiching County

KOOCHICHING-VERMILION (Northome) — At a recent stockholders meeting it was decided to contract for the sinking of a shaft and begin operations at once. The property is a gold prospect 100 miles north of the Cuyuna iron range.

MISSOURI

Joplin District

BAILEY & CO. (Spring City)—Zinc, lead and calamine are being hoisted. The mine is on the St. Paul land, near the Delta, a good calamine producer.

R., L. & S. CO. (Lawton)—The new concentrator was started up a few weeks ago. A 20-acre lease is held by the company and two shafts are being operated.

HAWKEYE (Miami, Okla.)—This mill has been sold to O. J. McConnell and will be removed to a lease on Tar Creek, near Hattenville. It is to be remodeled and enlarged.

PRAIRIE (Miami, Okla.)—The mill is to resume operations after a shutdown to permit the mill shaft being sunk deeper and some repairs to the plant. It is on the Emma Gordon land.

POWHATAN (Thoms Station)—Five hundred tons of zinc ore were produced in August from this mine, which has been in operation two months. There is a 150-ton mill on the 10-acre lease. New ground is being worked.

DUNGLADE & CO. (Thoms Station)—A concentrator is to be built by this company, which hopes to be milling within 60 days. The shaft recently was sunk after several drill holes were put down, and a drift now is being cut to connect with another shaft.

ORNDUFF & CO. (Joplin)—Galena was encountered last week while sinking deeper for water. The ore was found at the 83-ft. level, a 12-ft. face being encountered. The company has another shaft near, which is producing zinc ore from a depth of 120 feet.

MURPHY LAND (Galena, Kan.)—Material is being removed from the bed of Short Creek, where work was started to clean out the bed at the end of a large flume. It was discovered that when milled this material yielded mineral. Much of the dirt has been run through a mill.

PORTLAND LEAD & ZINC CO. (Joplin, Mo.)—A good sheet-ground mine has been opened at Prosperity. A 300-ton concentrator is being built on a 40-acre lease. Several drill holes have been put down and a shaft has been sunk to a depth of 227 ft. with five drifts extending into mineralized ground. About 4000 tons of rich ore is on the dump awaiting completion of the concentrator.

St. Francois County

ST. JOSEPH LEAD CO. (Bonne Terre)—This company will take over the Doe Run Lead Co. The $10,000,000 treasury stock of St. Joseph company will be offered in exchange for the outstanding $10,000,000 stocks and bonds of the Doe Run.

MONTANA

Butte District

DAVIS-DALY (Butte)—The Colorado mine is yielding about 100 tons per day and a little profit is being made.

TUOLUMNE (Butte)—The company is still just about breaking even in its operations. Shaft sinking is going on and about 100 tons of ore per day are hoisted.

ANACONDA (Butte)—The experimental plant, designed to treat slimes and tailings, as well as ore, by a leaching process perfected in the company's laboratory, is undergoing preliminary trials.

BELMONT (Butte)—The new orebins at this mine of the Anaconda company, which are nearly completed, are the largest in the Butte district, having a capacity of 10,000 tons. Through the Belmont shaft a large portion of the Anaconda Hill mines will be worked.

BUTTE & SUPERIOR (Butte)—According to the report for August the production of zinc concentrate was 11,167,270 lb., of an average assay of 49.41% zinc. The recovery, from 30,440 dry tons milled, was 90.9%. The profit for the month is given at $140,000.

RAVEN (Butte)—On orders from the East, Raven operations have been discontinued and pumps are being pulled from the mine. The treasury is exhausted, and results of development do not justify continuance of exploration or levying of another assessment. The company has been receiving about $2000 per month from ore shipped.

Lincoln County

SHAUGHNESSY (Libby)—At this mine of the Hazel T. Mining Co. development work is being done and preparations are being made to ship a carload of ore to the smeltery. Officials of the company state that a concentrator will be erected in the near future. Silver and lead ore is produced.

Madison County

BOSS TWEED (Pony)—Edward Smith is operating this property under a lease with a force of about 20 men. Recently a body of milling ore averaging about $10 per ton, was opened on the 600-ft. level, and drifting is being done on this ore. The mill at the mine is being operated steadily.

PONY MINING & MILLING CO. (Pony)—This company, a reorganization of the Garnet Mining Co., has been operating this property near Pony since June with a force of 12 men The ore bins are full and ore is being placed on the dump preparatory to treating it in the mill, which will be started as soon as repairs now in progress are completed.

NEVADA

Comstock Lode

SIERRA NEVADA (Virginia City)—Techow & Waterhouse, lessees on croppings, have started the building of a 50-ton mill, to be completed by Oct. 15.

CROWN POINT (Virginia City)—Operations on this property as well as the Belcher and Yellow Jacket adjoining are being concentrated upon preparations for the installation of the new pumping plant in the joint incline in Belcher ground. The Yellow Jacket mill is being overhauled, and new foundations placed under the concentrator floor.

C. & C. SHAFT (Virginia City)—One of the Starrett pumps designed for use at the Consolidated Virginia winze on the 2500-ft. level to unwater to the 2700, has been overhauled and is ready for installation. A second pump of the same pattern and make, has been shipped from Salt Lake City. Two additional air compressors are being placed on the surface to furnish air to operate the pumps.

Clark County

ST. ANTHONY (Goodsprings)—Considerable work is being done on the Columbia group, owned by this company. A new hoisting plant has been installed and occasional shipments of copper ore are made to Salt Lake smelters.

BULLION (Goodsprings)—This property is shipping five cars of crude lead ore per month to Salt Lake smelters, the ore being transported to the road by the new aërial tramway. Development work has proved the presence of large shoots of lead ore of too low grade to ship crude, and the company is contemplating the building of a concentrator.

Humboldt County

ELECTRIC POWER FOR ROCHESTER will be furnished, it is stated, by the Woolsey-Lovelock Power & Light Co. A power line nine miles long will be required.

Ormsby County

THE BULLION TAX QUESTION has been settled and an agreement has been made between the tax commission and the representatives of the mine owners, who met at Carson City recently, whereby about $100,000 back taxes will be collected from mining companies in Nye and Esmeralda Counties, and future levies will be made on only 60% of the net profits of the mines. This percentage to vary according to the assessment on other property. This is considered equivalent to the assessment on other property. Agreements in regard to costs chargeable against gross profits were: Cost of plants to be spread over life of mine, with annual depreciation allowed, to a limit of 20% of the original cost; charges for mine officials limited; interest charges excluded. Mine improvements are to be assessable on same basis as other property.

Washoe County

PYRAMID MINE (Pyramid Lake)—Considerable damage was done recently by a cloudburst. The assay office was badly damaged, ore wagons washed down the gulch and the roads destroyed.

White Pine County

NEVADA CONSOLIDATED (Ely)—The new strike of sulphide ore on the Ora claim of Giroux may prove to be of as great importance to Nevada Consolidated as it is to the Giroux. The Ora claim is practically surrounded by Nevada Consolidated ground, and churn drilling done by the latter company during the last few weeks has proved that the new orebody runs well over into Nevada Consolidated ground. One churn-drill hole sunk by the Nevada Consolidated on the Josie claim went down 150 ft. in ore reported to average 2% when water was encountered and the hole was lost by caving. Nevada Consolidated was never before in such good shape for a winter's campaign as it is this fall. Great quantities of ore in the Liberty and Eureka pits have been stripped of overburden and are ready for the shovels. Stripping of overburden has been pushed all during the summer, and August is reported to have broken all records for overburden removed.

CONSOLIDATED COPPERMINES (Ely)—General manager Gray has stated that ground may be broken for the company's new reduction plant this autumn. Citizens of Ely are desirous of having the plant built at Warm Springs, about 2½ miles northeast of Ely, and Mr. Gray has expressed himself as favorable to that site provided property owners will sign waivers of damages which might be caused by smoke or fumes from a smelter. Public sentiment is strongly in favor of building the plant at Warm Springs and it is probable that the majority of property owners will willingly sign the releases wanted. One steam shovel and two dinkey engines are on the road and it is probable that the first ore to be mined by the new shovel will be near Riepetown where there is a deposit of sulphide ore on Giroux ground demonstrated by prospecting with churn drills to contain upward of 4,000,000 tons of ore and with overburden not exceeding 40 ft. in thickness.

NEW MEXICO

Socorro County

MAUD MINING CO. (Mogollon)—A compressor is being installed to facilitate further sinking of the new shaft, now down a little over 500 feet.

SOCORRO-MINING & MILLING CO. (Mogollon)—The Clifton tunnel, being driven on the mother lode of the district, is expected at any time to encounter and drain the large flow of water found on the 500-ft. level last year, and which was bulkheaded at the time.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—Work preparatory to resumption of sinking was completed and actual sinking started Sept. 13. This included timbering of tunnel and unwatering and lining shaft. A large pump is on the ground and will be installed as soon as additional power is acquired, the flow in the meantime being hoisted.

TRI-BULLION (Kelly)—At a meeting to be held Sept. 30, stockholders will decide upon whether or not the board's recommendation about the sale of the properties at Kelly will be followed. It is stated that the operations of the Kelly group of claims, and the plant at Kelly, have, since Jan. 1, owing to the deterioration of the grade of ore and the fall in the price of spelter, been operated at a loss. The plant has been closed for upward of 90 days, as the obligations of the company total $40,000, and there are no cash assets. As there is no power in the corporation to levy an assessment upon the stock and it is deemed unwise to attempt to liquidate the obligations by a mortgage which might sacrifice all of the properties of the corporation, the board recommends acceptance of an offer that has been made for the purchase of the Kelly group of claims, including the plant for $87,500. The proceeds of the sale are to be applied in full payment of the obligations of the corporation and the surplus to the operation of the Starlight group of mining claims in Arizona, owned by, and the Nit group of mining claims, near Kelly, held by the corporation.

NORTH CAROLINA

Rowan County

GOLD HILL MINING CO. (Gold Hill)—A crosscut is being driven west on the 270-ft. level to cut the Newman vein, that was cut on the 800 level.

OREGON

Baker County

CORNUCOPIA—The management of this property is making arrangements to secure patents on 20 additional mining claims, which will make, with the 21 claims already held by patent, 41 claims in the group of mines. Benjamin B. Lawrence, of New York, is said to be one of the new owners of this property.

Curry County

SALMON MOUNTAIN PLACER—This mine on the north slope of Salmon Mountain, at an elevation of 2100 ft., has recently passed to new ownership and will be operated at once. This mine is equipped with hydraulic machinery, using water at 200-ft. head. The mine has been worked at irregular intervals for a number of years and pays from $75 to $100 per day when worked with present equipment. When new machinery is placed it will be a big producer.

Josephine County

STERLING (Jacksonville)—A large centrifugal pump has been installed on this placer property, and it is the intention of the company to continue operations throughout the year.

PENNSYLVANIA

Allegheny County

STANDARD CHEMICAL CO. (Pittsburgh)—Europe is now depending upon America for its supply of radium and America is furnishing it as fast as it can be produced. The Austrian government controls the output of radium bearing pitchblende from Joachimsthal in Bohemia, and conserves it for home use. Consequently European orders are filled in the United States. A recent Dresden order calls for 500 milligrams, worth $60,000. It is to be delivered in five monthly shipments of 100 milligrams each. The company at present produces about one gram of radium monthly. This amount will be considerably augmented in the near future as additional equipment for production, is now being installed.

SOUTH DAKOTA

Lawrence County

WASP NO. 2 (Lead)—The dividend for September is 2c. per share, meaning a disbursement of $10,000, and is the largest monthly dividend paid this year; improvements have been made which have been paid for out of profits.

HEIDELBERG—This property, which is being developed by the Deadwood Business club, is showing up well, and the first month's work is highly gratifying. A crew of men is employed in road construction, and as soon as the road is finished, which will probably be before Oct. 1, the force at the mine will be increased.

OLD IRONSIDES MINING CO. (Squaw Creek)—A corporation under this name has been organized and has taken over the lease on the Ironsides property, held by Ringley and associates. The lease runs until Jan. 1, 1915. The mine is being operated steadily, and has produced in the last few months several cars of smelting ore and some of milling grade. The company will drive a new crosscut tunnel to tap the ore, and it is estimated that this will be between 500 and 600 ft. in length.

GOLDEN REWARD (Deadwood)—The North Western and Burlington railways are building a joint track to connect the Astoria roaster with properties of the company lying north of the roaster, and when the connections are made it is expected that the plant will be started. The location of the new cyanide plant has not been agreed upon; the choice lies between Deadwood and adjacent to the roaster. Work is expected to commence at an early date after the engineers' report on the site has been made.

UTAH

Beaver County

MOSCOW (Moscow)—The new working shaft is down six sets, and when the new equipment has been installed, sinking will be more rapid.

Juab County

TINTIC SHIPMENTS for the week ended Sept. 12 were 151 cars. Shipments of zinc ore have been resumed by the Lower Mammoth, May Day, and other properties.

GRAND CENTRAL (Robinson)—A dividend of 5c. per share, or $25,000, has been declared, payable Sept. 25.

MAY DAY (Eureka)—Owing to the rise in the price of spelter, work on zinc ore has been resumed. The recently erected cyanide mill is treating about 1000 tons of dump ore monthly.

TINTIC STANDARD (Eureka)—Arrangements for ventilating the 1000-ft. level have been completed, and the development of the ore recently opened here can proceed without hindrance.

Salt Lake County

CARDIFF (Salt Lake City)—Work is being continued in the tunnel—1350 ft. long thus far—which is being driven to get under old workings. A streak of ore is being followed.

UTAH COPPER (Bingham)—The quarterly dividend of 75c. per share has been declared payable Sept. 30. The copper production for August is expected to be about 1,000,000 lb. in excess of that of July.

BINGHAM COPPER (Bingham)—Shares can now be exchanged for those of the Utah Lead & Copper Co. The rate of exchange is four shares of stock in the old company for one in the new. The stockholders receive $100 in bonds bearing interest from Sept. 1, 1913 for each $100 paid in assessments.

Summit County

PARK CITY SHIPMENTS for the week ended Aug. 30 amounted to 3,472,980 lb.; those for the week ended Sept. 12 to 3,372,980 pounds.

SILVER KING CONSOLIDATED (Park City)—The new three-compartment working shaft is down below the 1750-ft. level. This leaves about 50 ft. more of work in addition to a 35-ft. sump before the present sinking contract is completed. Dividend No. 1 of 25c. per share has been mailed to stockholders. Accompanying the dividend checks was a statement by President Spiro. This mentions the fact that the company has no debts, and that after the present dividend amounting to $155,000 is paid, there will be more than $500,000 cash in the treasury. The final payment of the judgment was made by the Silver King Coalition July 31. The total including accrued interest amounted to $908,453. When the shaft sinking has been completed, work will be started on the 1550-ft. level to reach the ore cut at 1470 ft., while sinking.

Tooele County

HIDDEN TREASURE (Dry Cañon)—Lessees are working, and are opening zinc ore of good grade. Some shipments are being made.

EUREKA-OPHIR (Dry Cañon)—A new orebody has been opened near the surface. Ore is being mined from this deposit, and also from the 275-ft. level. About a car of ore per month, carrying copper, silver and lead is being shipped.

BULLION COALITION (Stockton)—The old Honorine mill is being overhauled and placed in commission to treat a limited tonnage of second-class ore from this property. The ore is lead sulphide with pyrite. Three to four tons will be concentrated into one, and 25 to 30 tons treated daily. The mill has been idle for a number of years.

VIRGINIA

Prince William County

CABIN BRANCH (Dumfries)—Shipments of pyrites have been resumed. Barges have been loaded for Norfolk and Alexandria. The present output is coming from drifts in the mine. It is proposed to sink another shaft.

CANADA

Ontario

BUFFALO (Cobalt)—A dividend of 20%, payable Oct. 1, and an extra dividend of 7%, payable Nov. 15, have been declared.

SENECA-SUPERIOR (Cobalt)—The regular monthly dividend of 10% with an extra bonus of 2½% bonus payable Oct. 15, has been declared.

RIGHT OF WAY (Cobalt)—This company has given up its option on the seven Flynn and Gordon claims in Labelle Township, having failed to make important discoveries.

NIPISSING (Cobalt)—This company has decided to ship its silver bullion from Cobalt to New York instead of to London direct as heretofore as the result of trial shipments which have been made on favorable terms.

QUAKER CITY (Cobalt)—Preparations are being made to resume operations at this mine, which adjoins the Cochrane. Deep-mining will be attempted; the shaft will be sunk several hundred feet deeper and the ground explored.

KERR LAKE (Cobalt)—Since the partial draining of Kerr Lake six new veins, all carrying native silver have been found on the rock uncovered by the receding water. The largest has been traced for 50 ft. and will run upward of 3000 oz. of silver to the ton.

LA ROSE—The August production of silver was 226,267 oz. valued at $133,497, and the net profit $80,145. The cash surplus to Aug. 31 was $1,500,148 and the value of outstanding shipments of ore and ore ready for shipment $306,055, which deducting current liabilities left a net surplus of $1,780,124.

McKINLEY-DARRAGH (Cobalt)—Owing to the decrease in the cash surplus due to extensive underground development and the heavy expenditures incident to the enlarging of the concentrator, the directors decided to cut the quarterly dividend from 3% with a 7% bonus to 3% and 3% bonus.

HOLLINGER (Timmins)—Twenty stamps are to be added to the mill, making 60 in all and increasing the crushing capacity to 650 tons daily. Ground has been broken for the addition and the new stamps are expected to be in operation by the end of the year. Foundations are also being laid for the permanent central power plant, which will serve the Hollinger together with the Dixon, Gillies and Miller-Middleton mines.

BEAVER (Cobalt)—The quarterly report for the three months ended August 31 shows cash on hand and due from smelters and estimated value of ore ready for shipment amounting to $145,371, less accounts payable $17,460, leaving an available balance of $127,910. New veins have been encountered and new shoots opened up on some of the lower levels and plans are in preparation for sinking to 1500 ft. Some of the richest ore yet found in the mine is showing at the 700-ft. level.

Quebec

QUEBEC GRAPHITE CO. (Buckingham)—A complete plant for the manufacture of graphite has been installed at the works of this company and is now being tested.

MEXICO

Puebla

AN UPRISING OF INDIANS is reported in a Press despatch which states: "An American named Barron in a telegram to the American Embassy from Teziutlan, says that more than 1000 Federals under Col. Alfredo Torrea and Col. Alberto Guevara, have been besieged by rebel Indians from the Sierra de Zacapoaxtla since Sept. 16 last, Barron says the Indians are 6000 strong and have artillery. Fifteen shells have been fired into the town from 80 millimeter guns. The Indians have tried to capture the town by assault several times. Barron says the Federals can hold the town, but reinforcements are urgently needed. Many Americans are in the besieged town."

THE MARKET REPORT

METAL MARKETS

NEW YORK—Sept. 24

The metal markets are still generally strong. Some recessions in price are noted, but they are small and do not amount to any real reaction.

Copper, Tin, Lead and Zinc

Copper—Immediately following our last report, the buying demand, which had already relaxed, came nearly to a standstill. The antics of the London standard market disturbed the equanimity of some interests on this side, and certain of the smaller agencies, two at least, together with speculative second-hands began to try to find the market. In so doing they offered copper down to 16⅜c., cash, New York, at which price transactions have been made during the last two days, although their volume has not been large. In the meanwhile the larger agencies maintained their old asking price of 16⅞c., delivered, usual terms, although one of them at least has been apparently disposed to make concessions if such would result in the development of business. The fact is, however, that consumers have lately bought heavily and temporary cessation in buying is perfectly natural. American consumers are believed still to be short of covering their requirements for the near future, but in view of the momentary uncertainty are holding off in the hope of securing bargains.

The market for Lake copper continues wholly nominal. Aside from some driblets in second-hands the Calumet & Hecla has the only supply, and itself is probably unable to satisfy the requirements of its regular customers, many of whom for years have been unwilling to take anything but C. & H. copper.

At the close Lake copper is quoted nominally 16¾ @17c.; electrolytic in cakes, wirebars or ingots is 16.35@16.40c. We quote casting copper at 16.20@16.25c. nominally, as an average for the week.

The London standard market has been nervous, and while fluctuations have taken place, the market has been subject to conflicting influences. On Thursday, Sept. 18, spot copper was £73 5s. and three months £73 2s. 6d. On Friday, the market advanced about 7s. 6d., but on Monday it declined again to £72 15s. for spot and £72 12s. 6d. for three months. On Tuesday spot advanced to £74 2s. 6d. and three months to £73 17s. 6d., but on Wednesday, Sept. 24, the market again declined, closing at £72 12s. 6d. for spot and £72 10s. for three months.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾ @18c., carload lots at mill.

Exports of copper from New York for the week were 9120 long tons. Our special correspondent gives the exports from Baltimore at 2699 tons for the week.

Brass Prices are announced as follows to date from Sept. 15: Sheets, high brass, 17¼c. net per lb.; low brass, 19¼c. Wire, high brass, 17c.; low brass, 19¼c. Rods, high brass, 17c.; low brass, 20c. Tubes, brazed, or open seam, 21⅞c. Angles and channels, 21⅞c. Scrap allowances are 11¾c. net per lb. for high brass and 13¼c. for low brass.

Tin—Both the London and domestic markets were very dull throughout the week. Buyers fought shy, anticipating a further decline in price, in view of the pending Banka sale. At the lower level the tone of the market has hardened considerably, and that more confidence in its future is had is shown by the three months quotation, which is higher than spot, which has not been the case for a long time. The market closes firm at £191 5s. for spot and £191 12s. 6d. for three months and about 41.87½c. for September tin here.

Tin output of the Federated Malay States eight months ended Aug. 31 was 32,046 long tons in 1912 and 32,000 tons in 1913; decrease, 46 tons.

The exports from the Straits eight months ended Aug. 31, were 38,432 long tons in 1912 and 41,534 in 1913; increase, 3102 tons.

Lead—The market has been quiet and weakish. The demand has been small and some pressure to sell lead has developed. Prices in St. Louis have declined to 4.50@4.55c. and New York 4.65@4.70 cents.

The London market for Spanish lead is unchanged at £20 7s. 6d. for Spanish and English lead £1 higher.

Spelter—This market is also somewhat weaker. Buyers are not well covered but are holding back, and the little business that presents itself is eagerly competed for. In consequence, prices have suffered, and at the close St. Louis is quoted 5.45@5.50c.; New York 5.60@5.65 cents.

The London market is somewhat lower, good ordinaries being quoted £20 12s. 6d.; specials 12s. 6d. higher.

Base price of zinc sheets is now $8 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in August, at 1972 tons, of which only 9 tons were from South Africa, the rest being from Bolivia.

DAILY PRICES OF METALS

NEW YORK

Sept.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
18	4.8545	61	*16¼ @17	16.40 @16.50	42⅜	4.65 @4.75	4.55 @4.60	5.65 @5.70	5.50 @5.55
19	4.8560	61½	*16¼ @17	16.40 @16.45	42¼	4.65 @4.75	4.55 @4.60	5.65 @5.70	5.50 @5.55
20	4.8575	61⅝	*16¼ @17	16.40 @16.45	42⅛	4.65 @4.75	4.55 @4.60	5.62½ @5.67½	5.47½ @5.52½
22	4.8580	62⅛	*16¼ @17	16.35 @16.45	41¾	4.65 @4.70	4.50 @4.55	5.60 @5.65	5.45 @5.50
23	4.8570	61⅞	*16¼ @17	16.35 @16.40	41¾	4.65 @4.70	4.50 @4.55	5.60 @5.65	5.45 @5.50
24	4.8560	61¼	*16¼ @17	16.35 @16.40	41⅞	4.65 @4.70	4.50 @4.55	5.60 @5.65	5.45 @5.50

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Sept.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
18	28 3/16	73¼	73⅛	79¼	191¾	191¾	20¼	21
19	28⅛	73 11/16	73½	79¼	192½	192	20¼	20¾
20	28 5/16	....	....	....	....	....	....	....
22	28 11/16	72¾	72⅞	78¾	190¼	191	20½	20¾
23	28 9/16	74¼	73¼	79	190⅝	191⅜	20½	20⅜
24	28 7/16	72⅛	72½	78¾	191¼	191⅝	20⅜	20⅜

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Other Metals

Aluminum—The market is still dull, with only pressing business transacted. Quotations are 22@22¼c. per lb. for No. 1 ingots, domestic. Imported metal is quoted at 18@18¼c. in bond.

The latest London quotation £84@87 per long ton—equal to 18.25@18.90c. per lb.—for ingots.

Antimony—The market is still waiting the tariff settlement. Business is slow and prices practically unchanged. Cookson's is 8.25@8.50c. per lb.; Hallett's 7.75@8c.; while 7.25@7.50c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Business is better but prices remain about the same. New York quotation is $39 per flask of 75 lb. San Francisco, $39 for domestic orders and $36.50 for export. London price is unchanged at £7 5s. per flask, with £7 quoted from second hands.

Magnesium—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

Nickel—Quotations for ordinary forms, shot, blocks, or plaquettes are 40@45c. per lb .according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

Selenium—For large lots, 100 lb. or over, $3@3.25 per lb. is quoted: while $5 is paid for retail orders.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained at the Bank level 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. There was no special demand. Some gold is still coming from South America to London.

Iridium—There is no change in the position of this metal. The price remains high, $82@85 per oz. being asked for pure metal.

Platinum—The market is still unsettled. Sales have again been made as low as $43 per or., but dealers claim that the price is gradually hardening and still ask $45 per oz. Hard metal continues to bring $47@50 per oz., according to the proportion of iridium.

Silver has had a sudden upward turn. This is believed to be owing to purchasers on India Government account. China selling has produced a reaction and at the moment there is no special feature in the situation.

Shipments of silver from London to the East, Jan. 1 to Sept. 11, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£6,953,200	£5,128,500	D. £1,824,700
China	933,500	592,000	D. 341,500
Total	£7,886,700	£5,720,500	D. £2,166,200

The net imports of gold into India for the eight months ended Aug. 31 show a large decrease as compared with 1912. The total amount was £22,921,465 in 1912, and £12,688,932 in 1913; a decrease of £10,232,533, or 44.6%, this year.

Gold and silver movement in the United States eight months ended Aug. 31:

	Gold		Silver	
	1912	1913	1912	1913
Exports	$43,159,972	$73,583,242	$46,336,725	$43,166,040
Imports	34,589,111	41,572,860	32,652,869	24,331,964
Excess, exp.	$8,570,861	$32,010,382	$13,683,856	$18,834,076

Merchandise exports for the eight months this year were valued at $1,515,085,773; imports, $1,156,575,670; excess of exports, $358,510,103. Adding gold and silver gives $409,354,559 as the total export balance.

Zinc and Lead Ore Markets

JOPLIN, MO.—Sept. 20

The high price of zinc blende is $50, the base per ton of 60% zinc $43@48 for choice grades. Ores that have been under contract for several months were secured this week at an advance over prevailing prices. Calamine sold on a base of $21@23 per ton of 40% zinc. The average of all grades of zinc is $43.90. Some lead sold up to $58 per ton of 80% metal contents, with a downward tendency at the week-end, all grades averaging $56.32 per ton.

SHIPMENTS WEEK ENDED SEPT. 20

	Blende	Calamine	Lead	Value
Totals this week	10,677,700	831,320	1,723,340	$301,265
Totals 38 weeks	408,905,050	30,573,470	67,322,440	$11,370,599

Blende value the week, $241,725; 38 weeks, $9,184,789.

Calamine value, the week, 11,010; 38 weeks, $394,121.

Lead value, the week, 48,530; 38 weeks, $1,791,689

PLATTEVILLE, WIS.—Sept. 20

The base price paid this week for 60% zinc ore was a point lower than last week, $46@47 per ton. Lead base for 80% ore was the same, $58@59 per ton.

SHIPMENTS WEEK ENDED SEPT. 20, 1913

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,701,220	223,000	1,218,610
Year to date	108,393,700	5,166,290	42,907,910

Shipped during week to separating plants, 3,022,570 lb. zinc ore.

IRON TRADE REVIEW

NEW YORK—Sept. 24

The iron trade has grown distinctly quieter the last week, both in pig iron and in finished-steel products, though some lines are holding up well. The slackening may possibly be only temporary, due to the fact that the tariff bill is now finally to be enacted, but steel manufacturers are clearly disappointed that September has brought a decrease in business instead of the increase which the August improvement presaged.

The most interesting event of the week in the matter of prices has been the increase in aggressiveness of the American Sheet & Tin Plate Co. in the sheet market. Hitherto on the decline in prices, which started several months ago, the independents have made the first cuts, the leading interest merely following, but within the past week it has named some prices lower than had been made by independents

In plates and shapes the market is hardly any weaker, though perhaps merely because there has been little important business to interest the mills. There is renewed shading in wire products. Tubular goods hold up very well, with bookings as heavy as in August, and mills comfortably fixed for practically the balance of the year.

Pig iron is reported quiet in the West. In Seaboard territory there is an improved demand for foundry iron, and manufacturers are reported to be carrying small stocks in their yards.

Exports and Imports of Iron and Steel in the United States seven months ended July 31 are valued by the Bureau of Statistics of the Department of Commerce as follows:

	1912	1913	Changes
Exports	$164,963,425	$179,703,454	I. $14,740,029
Imports	15,960,533	20,872,124	I. 4,911,591
Excess, exports	$149,002,892	$158,831,330	I. $ 9,828,438

The increase of 8.9% in the value of exports was accompanied by a gain of 30.8% imports. The exports were the largest ever reported.

PITTSBURGH—Sept. 23

Steel production is believed to be at a slightly lower rate than a fortnight ago, and it is freely predicted that as some departments have reached the end of their accumulations of orders, there will be a distinct decrease in the total output within two or three weeks. For months the excess of shipments over current orders has been maintained by the steadily diminishing amount of old business remaining.

Pig Iron—The market has grown still quieter. Two interesting inquiries for basic iron were withdrawn late last week, leaving nothing upon which to figure. In foundry iron inquiry is limited to very small lots, except that Standard Sanitary has asked prices on about 2500 tons. Bessemer is also quiet. The furnaces have been talking higher prices on foundry and basic iron, $15.25. Valley, on foundry, and $14.50 on basic, but no sales appear to have been made above the old market of $14. We quote: Bessemer, $15.75@16; basic, $14@$14.25; No. 2 foundry, $14@14.25; malleable, $14.25; forge, $13.50@13.75, at Valley furnaces, 90c. higher, delivered Pittsburgh. Prompt foundry coke is offered in a limited way at cut prices, but is largely, if not wholly, under grade. Inquiry is beginning to develop for October coke, with standard grades still quoted at $2.50. It is reported that several operators who have been quietly holding $2.50 will openly join the ranks of the regular $2.50 operators.

Ferromanganese—The tone of the market is weaker, with rumors that there may be a formal reduction in the English pool's price. Openly prompt lots are offered at $55, Baltimore, and there are rumors of less having been done. Inquiry is light. We continue to quote the official asking price on prompt and forward at $56, Baltimore.

Steel—The market has been quite stagnant, with not enough inquiry to develop whether lower prices would be

made. The larger mills appear to be standing well together. We continue to quote billets at $25 and sheet bars at $26, maker's mill, Pittsburgh. Rods have softened to $27, Pittsburgh.

IRON ORE

Lake iron-ore shipments continue pretty well up to the mark. It is believed that the September shipments will about equal those of August. In the East the market is quiet, and little or nothing is being done with foreign ores.

British Imports of Iron Ore eight months ended Aug. 31 were 4,235,025 long tons in 1912, and 5,244,949 in 1913; increase, 1,009,924 tons. Imports of manganese ore were 211,762 tons in 1912, and 406,419 in 1913; increase, 194,657 tons.

Imports and Exports of Iron Ore in the United States seven months ended July 31, long tons:

	1912	1913	Changes
Imports	1,180,053	1,408,170	I. 228,117
Exports	498,950	521,497	I. 22,547

Imports of manganese ore for the seven months were 120,310 tons in 1912 and 227,731 in 1913; increase 107,421 tons.

COKE

Connellsville coke is now held steadily at $2.50 per ton for furnace coke. It is claimed that the cutting reported for two weeks past has ceased. Production decreased a little last week.

Anthracite Shipments in August were 5,369,000 tons. For the eight months ended Aug. 31 the total shipments were 38,958,723 long tons in 1912, and 45,709,606 in 1913; an increase of 6,750,883 tons this year.

Coal Passing through Sault Ste. Marie canals, season to Aug. 1, short tons:

	1912	1913	Changes
Anthracite	505,225	1,425,554	I. 920,320
Bituminous	5,981,229	7,986,881	I. 2,005,652
Total	6,486,454	9,412,435	I. 2,925,981

The large gain in anthracite was due to the very light shipments in the early part of last season.

Exports of Fuel from Great Britain eight months ended Aug. 31 were: Coal, 42,501,446; coke, 599,275; briquettes, 1,223,046; coal sent abroad for use of steamers in foreign trade, 11,970,713; total, 56,294,480 long tons. The total in 1912 was 44,274,901 tons, showing an increase of 12,019,579 tons, or 27.1% this year. Imports were 179,398 tons in 1912, and 14,515 in 1913; a decrease of 164,883 tons.

SAULT STE. MARIE CANAL TRAFFIC

The total freight passing through the Sault Ste. Marie canals in July was 12,278,124 short tons. For the season to Aug. 1 the total tonnage was:

	1912	1913	Changes
East-bound	23,266,029	27,393,691	I. 4,127,662
West-bound	7,366,045	10,279,796	I. 2,913,751
Total	30,632,074	37,673,487	I. 7,041,413

The number of vessel passages this year was 10,850, showing an average cargo of 3472 tons. The mineral freights included in the totals were, in short tons except salt, which is given in barrels:

	1912	1913	Changes
Coal	6,486,454	9,412,435	I. 2,925,981
Iron ore	20,248,973	23,344,042	I. 3,095,069
Pig and manuf. iron	296,648	198,762	D. 97,886
Copper	46,938	46,967	I. 29
Building stone	2,282	5,973	I. 3,691
Salt, bbl.	362,286	335,136	D. 27,150

Iron ore was 62% and coal 25% of the total freight tonnage this year.

CHEMICALS

NEW YORK—Sept. 24

The general chemical trade shows marked increase in activity since the opening of September. The demand for raw materials has been particularly good.

Arsenic—The market is dull, with few sales. Quotations are $3@3.25 per 100 lb. nominally.

Copper Sulphate—Business is good. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—The preparations for spring trade have not begun yet and the market is dull. The quotations are 2.40c. per lb. for both spot and futures.

OTHER ORE MARKETS

Manganese Ores—The schedule of prices adopted by the Carnegie Steel Co. is as follows, for deliveries in the Pittsburgh district or at South Chicago: Ore containing 49% or over metallic manganese, 25c. per unit; 46 to 49%, 24c.; 43 to 46%, 23c.; 40 to 43%, 22c. These prices are based on ores containing not more than 8% silica or 0.20% phosphorus. Deductions will be made of 15c. per ton for each 1% of silica in excess of 8%; of 2c. per unit of manganese for each 0.02% of phosphorus in excess of 0.20%. Ores containing less than 40% manganese, more than 12% silica or 0.225% phosphorus are subject to acceptance or refusal at buyer's option.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	April	May	June	July	August
Alaska shipments	1,730,252	1,771,508	2,203,191	2,705,136	1,847,785
Anaconda	23,800,000	25,600,000	21,500,000	22,100,000	22,500,000
Arizona, Ltd.	3,100,000	3,200,000	3,000,000	2,600,000	1,800,000
Copper Queen	8,210,166	8,301,605	7,477,936	8,369,607	8,252,404
Calumet & Ariz.	4,500,000	4,300,000	4,000,000	3,800,000	4,500,000
Chino	3,925,409	3,883,611	3,682,706	4,831,185	6,050,867
Detroit	1,856,517	2,001,633	1,750,601	1,549,224	2,187,223
East Butte	1,400,000	1,268,595	1,055,646	1,060,257	.....
Mammoth	1,450,000	1,700,000	1,750,000	1,800,000	1,750,000
Giroux*	600,000	625,000	610,000	610,000	.....
Mason Valley	1,264,304	1,186,560	1,097,014	908,892	.....
Miami	.....	1,943,900	2,612,000	.....	.....
Nevada Con.	5,650,000	5,933,275	6,344,863	5,403,919	.....
Ohio	690,001	650,071	537,400	601,700	.....
Old Dominion	3,040,000	2,749,000	2,511,000	2,526,000	2,524,000
Ray	4,379,128	4,384,400	4,392,612	4,097,000	.....
Shannon	1,238,000	1,080,000	924,000	880,000	1,248,000
South Utah	132,267	200,000	185,000	140,000	223,498
Tennessee	1,718,188	§1,037,115	1,379,220	1,247,804	.....
United Verde*	3,000,000	3,000,000	2,900,000	3,000,000	.....
Utah Copper Co.	9,539,847	10,003,227	11,637,949	9,849,043	10,302,251
Lake Superior*	17,000,000	18,705,000	16,500,000	17,500,000	9,700,000
Non-rep. mines*	6,000,000	6,300,000	6,000,000	6,200,000	.....
Total prod.	104,224,079	109,824,500	104,051,138	101,758,167	.....
Imports, bars, etc.	25,578,297	22,205,942	18,255,267	29,029,990	.....
Total blister	129,802,376	132,030,442	122,306,405	130,788,157	.....
Imp. ore & matte.	7,177,363	10,528,562	7,497,002	8,527,046	.....
Total Amer.	136,979,739	142,559,004	129,803,407	139,315,203	.....
Miami†	2,312,900	.....	.....	2,890,000	3,097,500
Shattuck-Arizona	1,158,326	1,026,170	1,059,625	1,019,388	1,001,634
Brit. Col. Cos:					
British Col. Cop.	794,000	618,076	634,238	618,379	.....
Granby	1,857,452	1,782,570	1,789,000	1,664,102	1,847,344
Mexican Cos.:					
Boleo†	2,811,200	2,424,800	1,984,640	2,240,720	2,264,640
Cananea	3,581,690	2,272,000	2,908,000	3,328,000	3,186,000
Moctezuma	2,753,240	2,695,881	3,438,793	2,693,006	3,542,047
Other Foreign:					
Braden, Chile	1,512,000	1,150,000	1,804,000	1,046,000	1,572,000
Cape Cop., S. Af.	586,880	387,520	414,400	.....	.....
Kyshtim, Russia	2,544,640	1,490,000	1,000,000	2,500,000	.....
Spassky, Russia	974,400	721,280	835,520	660,800	.....
Exports from					
Chile	7,616,000	3,584,000	5,824,000	9,856,000	8,736,000
Australia	6,608,000	7,840,000	7,616,000	10,304,000	6,720,000
Arrivals-Europe†	10,545,920	13,661,760	5,277,440	11,728,640	14,624,960

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VIII'12	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII.	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III.	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII.	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII.	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX.	.....	.....	.....	38,314,037	63,716,800	102,030,837

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq.	Sale	Amt.
Alpha Con., Nev.	Sept. 22	Oct. 15	0.02
American, Utah	Sept. 18	Oct. 18	1.00
Confidence, Nev.	Sept. 23	Oct. 14	0.10
Copper King, Ida.	Sept. 14	Oct. 14	0.01
Copper Mountain, Ida.	Sept. 6	Oct. 4	0.002
Emerald, Utah (3d install.)	Sept. 15	Oct. 11	0.005
Emma, Utah	Sept. 19	Oct. 18	0.005
Gold Hill, Ida.	Sept. 10	Sept. 30	0.0005
Great Western Con., Nev.	Sept. 15	Oct. 9	0.01
Hamburg-American, Ida.	Sept. 8	Sept. 29	0.000½
Justice, Nev.	Sept. 8	Sept. 30	0.02
Lower Mammoth, Utah	Sept. 11	.....	0.01
Lucky Calumet, Ida. (postpo'd)	Aug. 11	Oct. 10	0.005
Lucky Swede, Ida.	Sept. 20	Oct. 16	0.003
McKinley Gold, Ida.	Sept. 8	Oct. 8	0.0005
Mexican Metals (Boston)	.....	Oct. 10	0.15
Moonlight, Ida.	Sept. 30	Oct. 3	0.005
Oreano, Ida.	Sept. 1	Oct. 1	0.0015
Sierra Nevada, Nev.	Sept. 25	Oct. 25	0.10
Silver Flat, Utah	Sept. 22	Oct. 2	0.001
Silver Mountain, Ida.	Sept. 15	Oct. 15	0.002
Slavonia, Ida.	Sept. 10	Sept. 30	0.002
St. Louis, Calif.	Sept. 22	Oct. 4	0.01
Sunset, Nev.	Sept. 2	Oct. 13	0.01
Sunshine, Ida.	July 1	Oct. 15	0.001
Teddy, Ida.	Sept. 15	Oct. 15	0.001
Yellow Jacket, Nev.	Sept. 8	Oct. 8	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60 835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 23

Name of Comp.	Bid.
Acacia	.02¾
Cripple Cr'k Con.	.01
C. K. & N.	.08
Doctor Jack Pot	.05¾
Elkton Con.	.11½
El Paso	3.75
Findlay	.02½
Gold Dollar	.10½
Gold Sovereign	.02¾
Isabella	.10½
Jack Pot	.04½
Jennie Sample	.05
Lexington	‡.005
Moon Anchor	‡.006
Old Gold	.01½
Mary McKinney	.59½
Pharmacist	.01½
Portland	.96
Vindicator	.88

SALT LAKE Sept. 23

Name of Comp.	Bid.
Beck Tunnel	‡ .04
Black Jack	.08½
Cedar Talisman	.01½
Colorado Mining	.11
Columbus Con.	‡.05
Crown Point	.01½
Daly-Judge	6.10
Grand Central	.48
Iron Blossom	1.25
Little Bell	‡.10
Lower Mammoth	‡.00¾
Mason Valley	5.50
May Day	.06
Nevada Hills	‡.90
New York	‡.03
Prince Con.	.30
Silver King Coal'n	3.40
Sioux Con.	.01
Uncle Sam	.04½
Yankee	‡.08

TORONTO Sept. 22

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.05	Foley O'Brien	.20
Coniagas	7.20	Hollinger	17.00
T. & Hudson Bay	‡70.00	Imperial	‡.02
Timiskaming	.24	Jupiter	.15
Wettlaufer-Lor.	.12	Pearl Lake	.31
Apex	‡.01	Porcu. Gold	.08
Big Dome	12.50	Preston E. D.	‡.01
Crown Chartered	‡.00¾	Rea	.15
Doble	.10	Swastika	.03
Dome Exten	.05	West Dome	.10

SAN FRANCISCO Sept. 22

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	‡.05	Belmont	7.37½
Belcher	.21	Jim Butler	.72
Best & Belcher	.05	MacNamara	.12
Caledonia	1.35	Midway	.45
Challenge Con.	.07	Mont.-Tonopah	1.15
Chollar	.03	North Star	.59
Confidence	.35	West End Con.	1.67½
Con. Virginia	.09	Atlanta	.14
Crown Point	.19	Booth	.02
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.06	Comb. Frac.	.04
Mexican	1.10	Jumbo Extension	.12
Occidental	.70	Pitts.-Silver Peak	‡.44
Ophir	.23	Round Mountain	.40
Overman	.39	Silver Pick	.04
Potosi	.03	Tramp Con.	‡.01
Savage	.11	Argonaut	2.50
Sierra Nevada	.03	Bunker Hill	1.75
Union Con.	.11	Central Eureka	.12
Yellow Jacket	.28	So. Eureka	2.75

N. Y. EXCH. Sept. 23

Name of Comp.	Clg.
Amalgamated	77½
Am. Agri. Chem.	46½
Am.Sm.&Ref.,com.	67½
Am. Sm. & Ref., pf.	101½
Am. Sm. Sec., pf. B	82
Anaconda	38
Batopilas Min.	1
Bethlehem Steel,pf.	73½
Chino	42½
Federal M. & S., pf.	38½
GreatNor.,ore,ctf.	39
Guggen. Exp.	46¾
Homestake	105
Inspiration Con.	16½
Miami Copper	23½
Nat'l Lead, com.	47¾
National Lead, pf.	104
Nev. Consol.	17
Phelps Dodge	188
Pittsburg Coal, pf.	88½
Quicksilver, pf.	3½
Ray Con.	19½
Republic I&S,com.	24
Republic I&S, pf.	88½
SlossSheffi'd,com.	35
Sloss Sheffield, pf.	89
Tennessee Copper	32¾
Utah Copper	53¾
U. S. Steel, com.	64
U. S. Steel, pf.	109½
Va.Car.Chem.,pf.	101

N. Y. CURB Sept. 23

Name of Comp.	Clg.
Ariz. Belmont	.24
Barnes King	1.60
Beaver Con.	.33
Big Four	.25
Braden Copper	7⅛
B. C. Copper	2½
Buffalo Mines	2¼
Can. G. & S.	.19
Con. Ariz. Sm.	.25
Davis-Daly	2½
Diam'field-Daisy	2½
Ely Con.	.05½
Florence	.23
Giroux	1¼
Gold Hill Con.	.25
Goldfield Con.	1 5/16
Greene Cananea	33
Greenwater	.04
Internat. S. & R.	‡115
Kerr Lake	4 1/16
Keystone	‡1½
La Rose	2¼
McKinley-Dar-Sa	1 9/16
Min. Co. of A. new	2¼
Nipissing Mines	8¾
Ohio Copper	.50
Pacific Sm. & M.	1/16
Puebla S.& R.	2½
South Utah M&S.	3/16
Stand'd Oil of N.J.	369
Stewart	1 9/16
Tonopah	4¼
Tonopah Ex.	2
Tonopah Merger	.68
Tri-Bullion	3/16
Tularosa	1/16
Union Mines	.06
United Cop., pfd.	3
West End Ex.	.06
Yukon Gold	2 1/16

LONDON Sept. 13

Name of Comp.	Clg.
Camp Bird	£0 16s 0d
El Oro	0 14 6
Esperanza	1 0 0
Mexico Mines	6 0 0
Oroville	0 7 6
Santa Gert'dis.	0 18 9
Stratton's	0 1 6
Tomboy	1 6 3

BOSTON EXCH Sept. 23

Name of Comp.	Clg.
Adventure	1½
Ahmeek	277
Alaska Gold M.	20¾
Algomah	1½
Allouez	26½
Am. Zinc	21
Ariz. Com., ctfs.	4 5/16
Bonanza	.32
Boston & Corbin	75
Butte & Balak	3¾
Calumet & Ariz.	68
Calumet & Hecla	445
Centennial	14½
Cliff	1½
Copper Range	39½
Daly West	2
East Butte	12½
Franklin	4
Granby	74½
Hancock	18½
Hedley Gold	30
Helvetia	45
Indiana	5
Island Cr'k, com	52½
Island Cr'k, pfd	85
Isle Royale	20
Keweenaw	1⅛
Lake	8½
La Salle	4
Mass.	2½
Michigan	1¼
Mohawk	43¾
New Arcadian	2½
New Idria Quick	3
North Butte	28½
North Lake	1½
Ojibway	.75
Old Dominion	52½
Osceola	85
Quincy	63
Shannon	7½
Shattuck-Ariz.	30
Superior	26¾
Superior & Bost.	3
Tamarack	33
Trinity	4¼
Tuolumne	.50
U. S. Smelting	41½
U. S. Smelt'g, pf.	48¾
Utah Apex	2½
Utah Con.	9½
Victoria	1 1/16
Winona	.95
Wolverine	45½
Wyandot	.80

BOSTON CURB Sept. 23

Name of Comp.	Bid
Bingham Mines	5¼
Boston Ely	.70
Butte&Lon'nDev.	.30
Cactus	.02
Calaveras	1½
Chief Cons.	1⅜
Corbin	1 1/16
Cortez	.30
Crown Reserve	1⅛
Eagle & Blue Bell	1 1/16
First Nat. Cop.	3⅜
Houghton Copper	3½
Majestic	.34
Mexican Metals	.32
Moneta Porc.	‡.07
Nevada-Douglas	2½
New Baltic	.70
Oneco	.80
Raven Copper	.07
Rhode Island Coal	.01
Smokey Dev.	1
So. Lake	3½
S. W. Miami	‡2½
South Lake	3¼
Trethewey	.28
United Verde Ext.	.55

‡Last Quotation.